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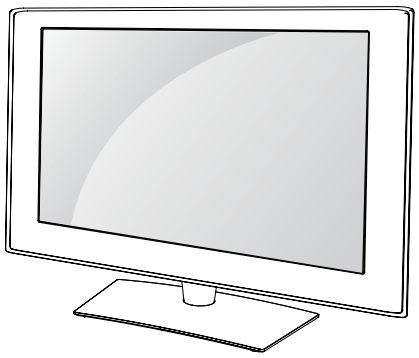
LED LCD TV
SERVICE MANUAL

CHASSIS : LB01V

MODEL : 26LV3000 26LV3000-TA

CAUTION
BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



P/NO : MFL62865337 (1105-REV00)

Printed in Korea

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SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and Exploded View.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and it's components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

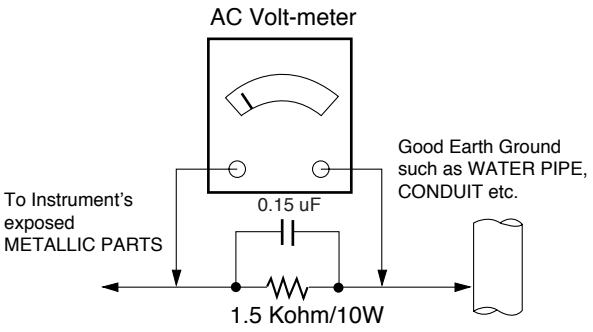
always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)
With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.
If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 MΩ and 5.2 MΩ.
When the exposed metal has no return path to the chassis the reading must be infinite.
An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)
Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.
Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.
Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which is corresponds to 0.5 mA.
In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω
*Base on Adjustment standard

SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the *SAFETY PRECAUTIONS* on page 3 of this publication.
NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
   CAUTION: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe.
   Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
   CAUTION: This is a flammable mixture.
   Unless specified otherwise in this service manual, lubrication of contacts in not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
   Always remove the test receiver ground lead last.
8. *Use with this receiver only the test fixtures specified in this service manual.*
   CAUTION: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called *Electrostatically Sensitive (ES) Devices.* Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
   CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500 °F to 600 °F.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle.
   Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
   a. Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

IC Remove/Replacement

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete Transistor Removal/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor

Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.
   CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

1. Application range

This specification is applied to the LCD TV used LB01V chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

1) Temperature
   : 25 ºC ± 5 ºC (77 ºF ± 9 ºF), CST : 40 ºC ± 5 ºC
2) Relative Humidity : 65 % ± 10 %
3) Power Voltage
   : Standard input voltage (AC 100-240 V~, 50 / 60 Hz)
   * Standard Voltage of each products is marked by models.
4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
5) The receiver must be operated for about 5 minutes prior to the adjustment.

3. Test method

1) Performance: LGE TV test method followed
2) Demanded other specification
   - Safety: CE, IEC specification
   - EMC:CE, IEC

4. Model General Specification

No.	Item	Specification	Remarks
1.	Market	Australia, NewZealand, Singapore, Malaysia, Vietnam, Indonesia, South Africa, Israel, A-ASIA	only Analog for A-ASIA
2.	Broadcasting system	1) PAL/SECAM-B/G/D/K 2) PAL-I/II 3) NTSC-M 4) DVB-T	PAL for NZ/SG
3.	Channel Storage	ATV-135EA, DTV-1000EA	
4.	Receiving system	Analog : Upper Heterodyne Digital : COFDM(DVB-T)	► DVB-T - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32 - Modulation : Code Rate QPSK : 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8
5.	Video Input RCA	PAL, SECAM, NTSC	4 System : PAL, SECAM, NTSC, PAL60
6.	Component Input	Y/Cb/Cr, Y/Pb/Pr	
7.	RGB Input (1EA)	RGB-PC	Analog(D-SUB 15PIN)
8.	HDMI Input	HDMI1-DTV/DVI HDMI2-DTV/DVI HDMI3-DTV/DVI	PC - HD Model : HDMI version 1.3 - FHD Model : HDMI version 1.4 Support HDCP
9.	Audio Input	RGB/DVI Audio Component AV	
9.	SDPIF out	SPDIF out	
10.	USB	For My Media(Movie/Photo/Music List) or For SVC	

5. Component Video Input (Y, P_B, P_R)

No.	Specification				Remark
	Resolution	H-freq(kHz)	V-freq(Hz)		
1.	720x480	15.73	60.00	SDTV,DVD 480i	
2.	720x480	15.63	59.94	SDTV,DVD 480i	
3.	720x480	31.47	59.94	480p	
4.	720x480	31.50	60.00	480p	
5.	720x576	15.625	50.00	SDTV,DVD 625 Line	
6.	720x576	31.25	50.00	HDTV 576p	
7.	1280x720	45.00	50.00	HDTV 720p	
8.	1280x720	44.96	59.94	HDTV 720p	
9.	1280x720	45.00	60.00	HDTV 720p	
10.	1920x1080	31.25	50.00	HDTV 1080i	
11.	1920x1080	33.75	60.00	HDTV 1080i	
12.	1920x1080	33.72	59.94	HDTV 1080i	
13.	1920x1080	56.250	50	HDTV 1080p	
14.	1920x1080	67.5	60	HDTV 1080p	

6. RGB Input (PC)

No.	Specification				Proposed	Remark
	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel Clock(MHz)		
1.	720*400	31.468	70.08	28.321		For only DOS mode
2.	640*480	31.469	59.94	25.17	VESA	Input 848*480 60 Hz, 852*480 60 Hz -> 640*480 60 Hz Display
3.	800*600	37.879	60.31	40.00	VESA	
4.	1024*768	48.363	60.00	65.00	VESA(XGA)	
5.	1280*768	47.78	59.87	79.5	WXGA	
6.	1360*768	47.72	59.8	84.75	WXGA	
7.	1280*1024	63.981	60.02	108.875	SXGA	FHD Model
8.	1920*1080	66.587	59.93	138.5	WUXGA	FHD model

7. HDMI Input

(1) DTV Mode

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	Remark
1.	720*480	31.469 /31.5	59.94 /60	27.00/27.03	SDTV 480P	
2.	720*576	31.25	50	54	SDTV 576P	
3.	1280*720	37.500	50	74.25	HDTV 720P	
4.	1280*720	44.96 /45	59.94 /60	74.17/74.25	HDTV 720P	
5.	1920*1080	33.72 /33.75	59.94 /60	74.17/74.25	HDTV 1080I	
6.	1920*1080	28.125	50.00	74.25	HDTV 1080I	
7.	1920*1080	26.97 /27	23.97 /24	74.17/74.25	HDTV 1080P	
8.	1920*1080	33.716 /33.75	29.976 /30.00	74.25	HDTV 1080P	
9.	1920*1080	56.250	50	148.5	HDTV 1080P	
10.	1920*1080	67.43 /67.5	59.94 /60	148.35/148.50	HDTV 1080P	

(2) PC Mode

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	Remark
1.	720*400	31.468	70.08	28.321		HDCP
2.	640*480	31.469	59.94	25.17	VESA	HDCP
3.	800*600	37.879	60.31	40.00	VESA	HDCP
4.	1024*768	48.363	60.00	65.00	VESA(XGA)	HDCP
5.	1360*768	47.72	59.8	84.75	WXGA	HDCP
6.	1280*1024	63.981	60.02	108.875	SXGA	HDCP/FHD model
7.	1920*1080	67.5	60.00	138.625	WUXGA	HDCP/FHD model

ADJUSTMENT INSTRUCTION

1. Application Range

This specification sheet is applied to all of the LCD TV with LB01V chassis.

2. Designation

1) The adjustment is according to the order which is designated and which must be followed, according to the plan which can be changed only on agreeing.
2) Power Adjustment: Free Voltage
3) Magnetic Field Condition: Nil.
4) Input signal Unit: Product Specification Standard
5) Reserve after operation: Above 5 Minutes (Heat Run)
   Temperature : at 25 ºC ± 5 ºC
   Relative humidity : 65 % ± 10 %
   Input voltage : 220 V, 60 Hz

* In case of keeping module is in the circumstance of 0°C, it should be placed in the circumstance of above 15°C for 2 hours.
* In case of keeping module is in the circumstance of below -20°C, it should be placed in the circumstance of above 15°C for 3 hours.

6) Adjustment equipments: Color Analyzer(CA-210 or CA-110), DDC Adjustment Jig equipment, Service remote control.
7) Push the “IN STOP” key - For memory initialization.

Case1 : Software version up
1. After downloading S/W by USB, TV set will reboot automatically
2. Push “In-stop” key.
3. Push “Power on” key.
4. Function inspection
5. After function inspection, Push “In-stop” key.

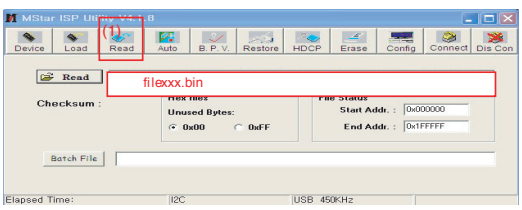
Case2 : Function check at the assembly line
1. When TV set is entering on the assembly line, Push “In-stop” key at first.
2. Push “Power on” key for turning it on.
   -> If you push “Power on” key, TV set will recover channel information by itself.
3. After function inspection, Push “In-stop” key.

3. Main PCB check process

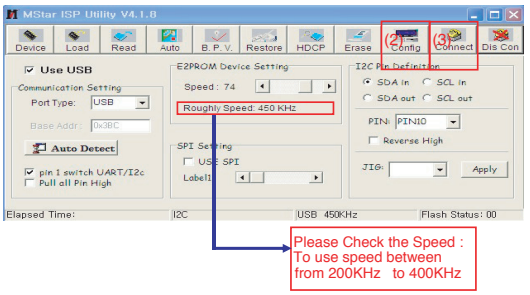
* APC - After Manual-Insert, executing APC

* Boot file Download

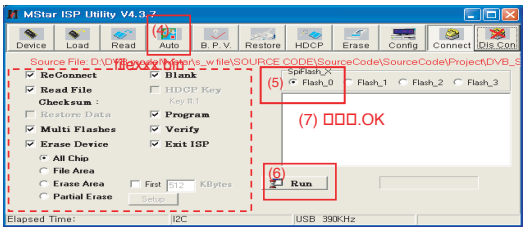
1) Execute ISP program “Mstar ISP Utility” and then click “Config” tab.
2) Set as below, and then click “Auto Detect” and check “OK” message. If “Error” is displayed, check connection between computer, jig, and set.
3) Click “Read” tab, and then load download file(XXXX.bin) by clicking “Read”.



4) Click “Connect” tab. If “Can’t” is displayed, check connection between computer, jig, and set.

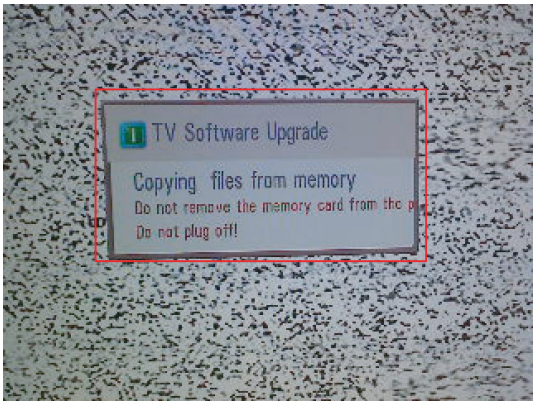


5) Click “Auto” tab and set as below.
6) Click “Run”.
7) After downloading, check “OK” message.

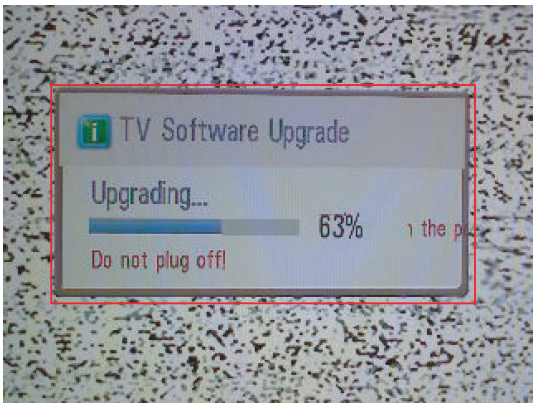


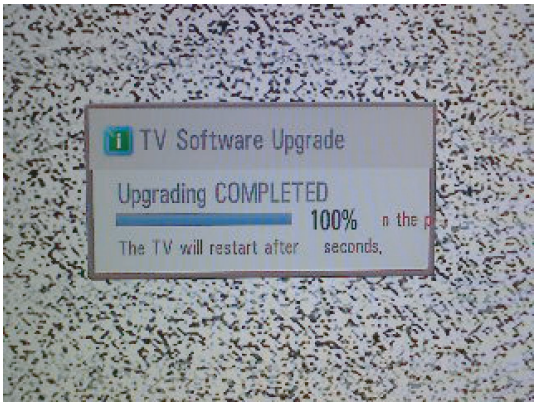
* USB DOWNLOAD

1) Put the USB Stick to the USB socket.
2) Automatically detecting update file in USB Stick.
   - If your downloaded program version in USB Stick is Low, it didn’t work. But your downloaded version is High, USB data is automatically detecting.
3) Show the message “Copying files from memory”.



4) Updating is starting.





5) Uploading completed, The TV will restart automatically.
6) If your TV is turned on, check your updated version and Tool option.(explain the Tool option, next stage)
   * If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ATV test on production line.

*** After downloading, have to adjust Tool Option again.**

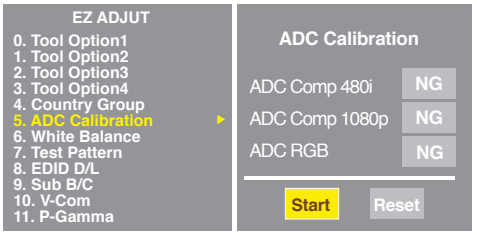
1) Push "IN-START" key in service remote control.
2) Select "Tool Option 1" and push "OK" key.
3) Punch in the number. (Each model has their number)

Module	Tool option1	Tool option2	Tool option3(AU,TS)	Tool option4	Tool option5
LGD	14336	18954	53545(-)	26904	288

4) Completed selecting Tool option.

3.1. ADC Process

(1) ADC
- Enter Service Mode by pushing "ADJ" key,
- Enter Internal ADC mode by pushing "▶" key at "5. ADC Calibration".



<Caution> Using 'power on' key of the Adjustment remote control, power on TV.

* ADC Calibration Protocol (RS232)

No	Item	CMD1	CMD2	Data0		
Enter Adjust Mode	Adjust 'Mode In'	A	A	0	0	When transfer the 'Mode In', Carry the command.
ADC adjust	ADC Adjust	A	D	1	0	Automatically adjustment (The use of a internal pattern)

Adjust Sequence
- aa 00 00 [Enter Adjust Mode]
- xb 00 40 [Component1 Input (480i)]
- ad 00 10 [Adjust 480i Comp1]
- xb 00 60 [RGB Input (1024*768)]
- ad 00 10 [Adjust 1024*768 RGB]
- aa 00 90 End Adjust mode

* Required equipment : Adjustment remote control.

3.2. Function Check

* Check display and sound
- Check Input and Signal items. (cf. work instructions)
  1) TV
  2) AV (SCART1/SCART2/ CVBS)
  3) COMPONENT (480i)
  4) RGB (PC : 1024 x 768 @ 60hz)
  5) HDMI
  6) PC Audio In

  * Display and Sound check is executed by Remote control.

4. Total Assembly line process

4.1. Adjustment Preparation

· W/B Equipment condition
CA210
: CCFL/EEFL -> CH9, Test signal: Inner pattern(80IRE)
LED -> CH14, Test signal: Inner pattern(80IRE)

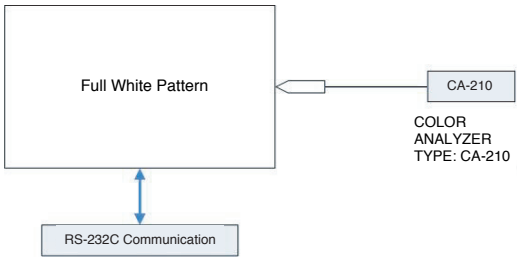
· Above 5 minutes H/run in the inner pattern. (“power on” key of adjustment remote control)

Cool	13,000	K	X=0.269(±0.002)	
			Y=0.273(±0.002)	<Test Signal>
Medium	9,300	K	X=0.285(±0.002)	Inner pattern
			Y=0.293(±0.002)	(204gray,80IRE)
Warm	6,500	K	X=0.313(±0.002)	
			Y=0.329(±0.002)	

· Edge LED W/B Table in process of aging time(Only LGD Edge LED Module except AUO, CMI, IPS Module)
CA210: CH14, Test signal : Inner pattern(80IRE)

GP2R	Aging Time (Min.)	Cool		Medium		Warm	
		X	Y	X	Y	X	Y
		269	273	285	293	313	329
1	0-2	279	288	295	308	319	338
2	3-5	278	286	294	306	318	336
3	6-9	277	285	293	305	317	335
4	10-19	276	283	292	303	316	333
5	20-35	274	280	290	300	314	330
6	36-49	272	277	288	297	312	327
7	50-79	271	275	287	295	311	325
8	8-149	270	274	286	294	310	324
9	Over 150	269	273	285	293	309	323

* Connecting picture of the measuring instrument
(On Automatic control)
Inside Pattern is used when W/B is controlled. Connect to auto controller or push Adjustment remote control P-ONLY-> Enter the mode of White-Balance, the pattern will come out.



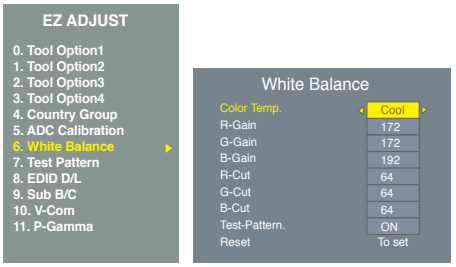
* Auto-control interface and directions
1) Adjust in the place where the influx of light like floodlight around is blocked. (Illumination is less than 10 lux).
2) Adhere closely the Color Analyzer (CA210) to the module less than 10 cm distance, keep it with the surface of the Module and Color Analyzer’s prove vertically.(80° ~ 100°).
3) Aging time
- After aging start, keep the power on (no suspension of power supply) and heat-run over 5 minutes.
- Using ‘no signal’ or ‘POWER ONLY’ or the others, check the back light on.

• Auto adjustment Map(RS-232C)
RS-232C COMMAND
[CMD ID DATA]
Wb 00 00 White Balance Start
Wb 00 ff White Balance End

	RS-232C COMMAND [CMD ID DATA]			MIN	CENTER (DEFAULT)			MAX
	Cool	Mid	Warm		Cool	Mid	Warm	
R Gain	jg	Ja	jd	00	172	192	192	192
G Gain	jh	Jb	je	00	172	192	192	192
B Gain	ji	Jc	jf	00	192	192	172	192
R Cut					64	64	64	128
G Cut					64	64	64	128
B Cut					64	64	64	128

<Caution>
Color Temperature : COOL, Medium, Warm.
One of R Gain/G Gain/ B Gain should be kept on 0xC0, and adjust other two lower than C0.(when R/G/B Gain are all C0, it is the FULL Dynamic Range of Module.)

* Manual W/B process using Adjustment remote control.
• After enter Service Mode by pushing “ADJ” key,
• Enter White Balance by pushing “▶” key at “6. White Balance”.



* After done all adjustments, Press “In-start” key and compare Tool option and Area option value with its BOM, if it is correctly same then unplug the AC cable. If it is not same, then correct it same with BOM and unplug AC cable. For correct it to the model’s module from factory Jig model.
* Push the “IN STOP” key after completing the function inspection. And Mechanical Power Switch must be set “ON”.

4.2. DDC EDID Write (RGB 128Byte)

• Connect D-sub Signal Cable to D-sub Jack.
• Write EDID Data to EEPROM(24C02) by using DDC2B protocol.
• Check whether written EDID data is correct or not.
* For Service main Assembly, EDID have to be downloaded to Insert Process in advance.

4.3. DDC EDID Write (HDMI 256Byte)

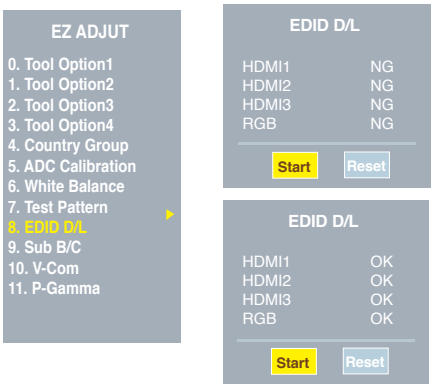
• Connect HDMI Signal Cable to HDMI Jack.
• Write EDID Data to EEPROM(24C02) by using DDC2B protocol.
• Check whether written EDID data is correct or not.
* For Service main Assembly, EDID have to be downloaded to Insert Process in advance.

4.4. EDID DATA

1) All Data : HEXA Value
2) Changeable Data :
*: Serial No : Controlled / Data:01
**: Month : Controlled / Data:00
***: Year : Controlled
****: Check sum

- Auto Download

1) After ener Service Mode by pushing “ADJ” key.
2) Enter EDID D/L menu.
3) Enter “START” by pushing “OK” key.



<Caution> Never connect HDMI && D-sub cable when EDID downloaded

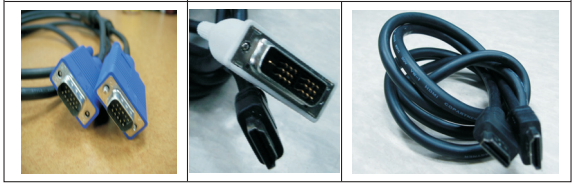
* Edid data and Model option download (RS232)

NO	Item	CMD1	CMD2	Data0		
Enter download Mode	Download ‘Mode In’	A	A	0	0	When transfer the ‘Mode In’, Carry the command.
EDID data and Model option download	Download	A	E	00	10	Automatically Download (The use of a internal pattern)

- Manual Download

* Caution
1) Use the proper signal cable for EDID Download.
- Analog EDID : Pin3 exists
- Digital EDID : Pin3 exists
2) Never connect HDMI & D-sub Cable at the same time.
3) Use the proper cables below for EDID Writing
4) Download HDMI1, HDMI2, separately because HDMI1 is different from HDMI2.

For Analog EDID	For HDMI EDID
D-sub to D-sub	DVI-D to HDMI or HDMI to HDMI



Item	Condition	Data(Hex)
Manufacturer ID	GSM	1E6D
Version	Digital : 1	01
Revision	Digital : 3	03

1) HD RGB EDID data

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	ff	ff	ff	ff	ff	ff	0	1e	6d	**a**		**b**			
10	**c**		1	3	68	10	9	78	0a	ee	91	a3	54	4c	99	26
20	0f	50	54	a1	8	0	81	c0	61	40	45	40	31	40	1	1
30	1	1	1	1	1	1	1b	21	50	a0	51	0	1e	30	48	88
40	35	0	a0	5a	0	0	0	1e	1	1d	0	72	51	d0	1e	20
50	6e	28	55	0	a0	5a	0	0	0	1e	0	0	0	fd	0	3a
60	3e	1f	46	10	0	0a	20	20	20	20	20	20	**d**			
70	**d**														0	e

2) HD HDMI EDID data

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	ff	ff	ff	ff	ff	ff	0	1e	6d	**a**		**b**			
10	**c**		1	3	80	10	9	78	0a	ee	91	a3	54	4c	99	26
20	0f	50	54	a1	8	0	81	c0	61	40	45	40	31	40	1	1
30	1	1	1	1	1	1	1b	21	50	a0	51	0	1e	30	48	88
40	35	0	a0	5a	0	0	0	1c	1	1d	0	72	51	d0	1e	20
50	6e	28	55	0	a0	5a	0	0	0	1e	0	0	0	fd	0	3a
60	3e	1f	46	10	0	0a	20	20	20	20	20	20	**d**			
70	**d**														0	e
80	2	3	20	f1	4e	10	1f	84	13	5	14	3	2	12	20	21
90	22	15	1	26	15	7	50	9	57	7	**f**					
A0	1	1d	80	18	71	1c	16	20	58	2c	25	0	a0	5a	0	0
B0	0	9e	1	1d	0	80	51	d0	0c	20	40	80	35	0	a0	5a
C0	0	0	0	1e	8c	0a	d0	8a	20	e0	2d	10	10	3e	96	0
D0	a0	5a	0	0	0	18	2	3a	80	18	71	38	2d	40	58	2c
E0	45	0	a0	5a	0	0	0	1e	1	1d	80	d0	72	1c	16	20
F0	10	2c	25	80	a0	5a	0	0	0	9e	0	0	0	0	0	**e**

* Detail EDID Options are below

ⓐ Product ID

Model Name	HEX	EDID Table	DDC Function
HD Model	0001	01 00	Analog/Digital

ⓑ Serial No: Controlled on production line.

ⓒ Month, Year: Controlled on production line:
ex) Week : ‘01’ -> ‘01’
Year : ‘2011’ -> ‘15’ fix

ⓓ Model Name(Hex):

MODEL	MODEL NAME(HEX)
all	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20

ⓔ Checksum: Changeable by total EDID data.

ⓕ Vendor Specific(HDMI)

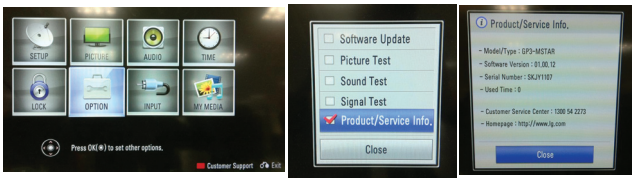
INPUT	MODEL NAME(HEX)
HDMI1	65030C001000
HDMI2	65030C002000
HDMI3	65030C003000

4.5. Hi-Spot Test

Confirm whether is normal or not when between power board’s ac block and GND is impacted on 1.5 kV(dc) or 2.2 kV (dc) for one second.

4.6. Model name & Serial number D/L

- Press “Power on” key of service remocon. (Baud rate : 115200 bps)
- Connect RS232 Signal Cable to RS-232 Jack.
- Write Serial number by use RS-232.
- Must check the serial number at the Product/Service info.(menu key -> red key -> select product/Service info)



4.6.1. Signal TABLE

CMD	LENGTH	ADH	ADL	DATA_1	. . .	Data_n	CS	DELAY

CMD : A0h
LENGTH : 85~94h (1~16 bytes)
ADH : EEPROM Sub Address high (00~1F)
ADL : EEPROM Sub Address low (00~FF)
Data : Write data
CS : CMD + LENGTH + ADH + ADL + Data_1 +…+ Data_n
Delay : 20ms

4.6.2. Command Set

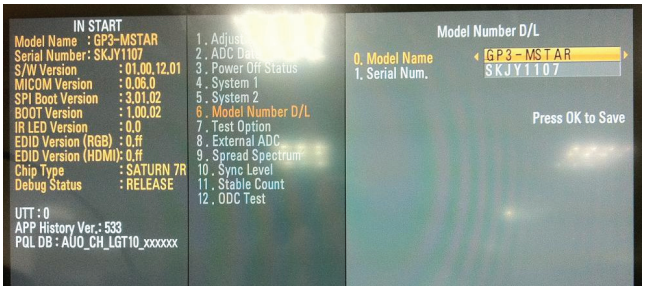
No.	Adjust mode	CMD(hex)	LENGTH(hex)	Description
1	EEPROM WRITE	A0h	84h+n	n-bytes Write (n = 1~16)

* Description
FOS Default write : <7mode data> write
Vtotal, V_Frequency, Sync_Polarity, Htotal, Hstart, Vstart, 0, Phase
Data write : Model Name and Serial Number write in EEPROM,.

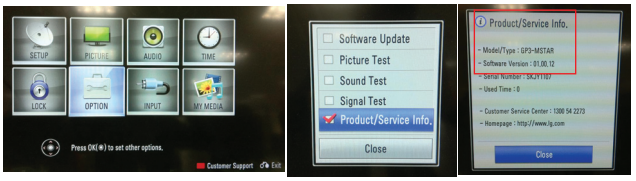
4.6.3. Method & notice

A. Serial number D/L is using of scan equipment.
B. Setting of scan equipment operated by Manufacturing Technology Group.
C. Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

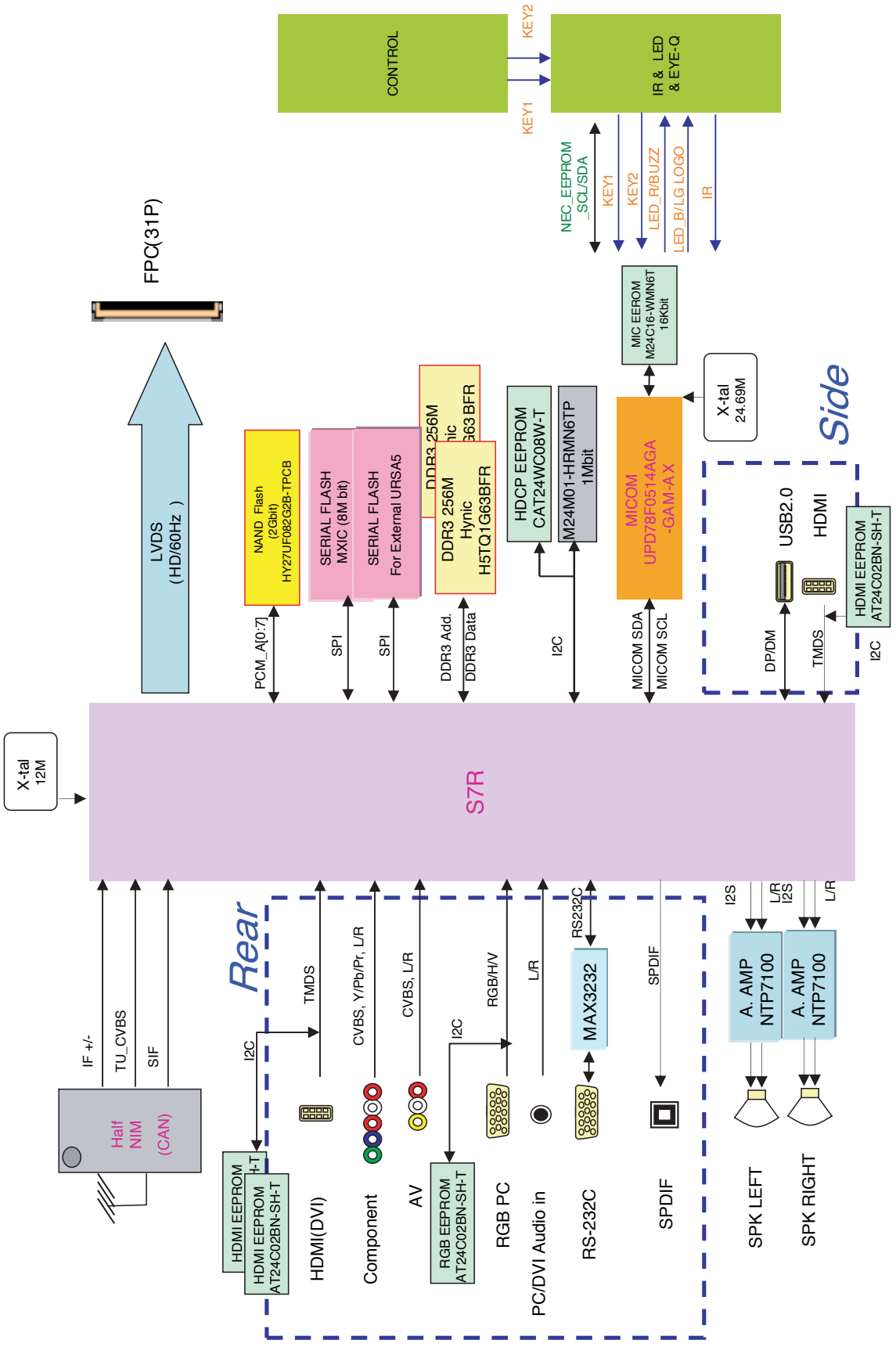
* Manual Download (Model Name and Serial Number)
If the TV set is downloaded by OTA or Service man, sometimes model name or serial number is initialized.(Not always)
There is impossible to download by bar code scan, so It need Manual download.
1) Press the ‘Instart’ key of Adjustment remote control.
2) Go to the menu ‘6.Model Number D/L’ like below photo.
3) Input the Factory model name(ex 32LV2510-TB) or Serial number like photo.



4) Check the model name Instart menu.
-> Factory name displayed. (ex 32LV2510-TB)
5) Check the Product/Service info..(Menu key -> Red key -> Select product/Service info)
-> Buyer model displayed. (ex 32LV2510-TB)



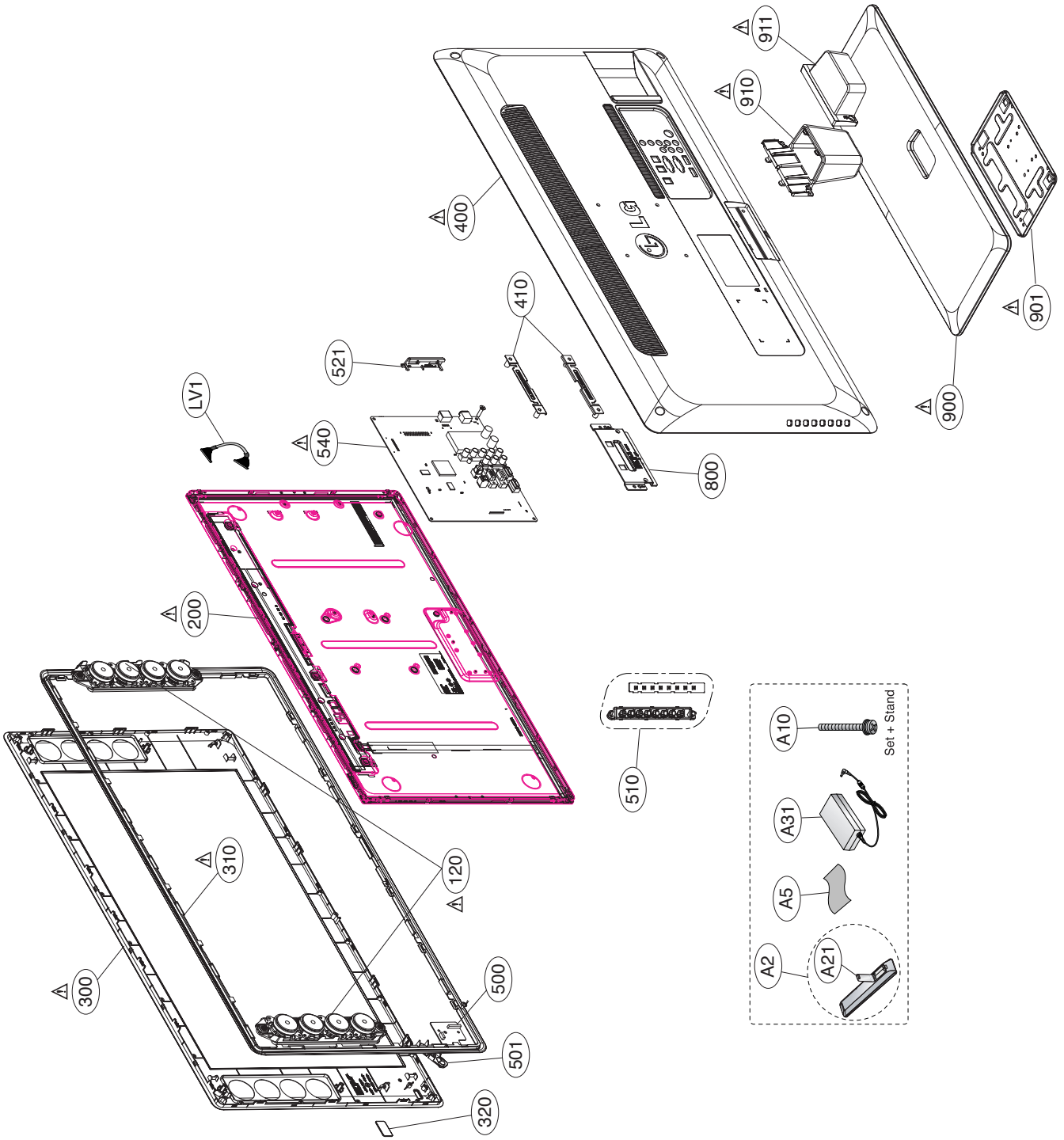
BLOCK DIAGRAM



EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and EXPLODED VIEW.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.



S7M-PLUS_DivX_MS10

LGE107DC-RP [S7M+ DIVX/MS10]

NAND FLASH MEMORY

IC102
NAND01GW3B2CN6E
NAND_FLASH_1G_NUMONYX
EAN60762401

/PF_CE0
H : Serial Flash
L : NAND Flash
/PF_CE1
H : 16 bit
L : 8 bit

+3.3V_Normal
R107 1K
R109 3.9K
/F_RB
/PF_OE
/PF_CE0
R108 1K
C101 0.1uF
VDD_1
VSS_1
R105 1K OPT
/PF_CE1
PF_ALE
/PF_WE
R104 10K OPT
Q101 KRC103S OPT
R106 1K
/PF_WP
R102 10K
PCM_A[0-7]
AR101
AR102
22
C102 10uF
C103 0.1uF

<T3 CHIP Config(AUD_LRCH)>

Boot from SPI flash : 1'b0
Boot from NOR flash : 1'b1

<T3 CHIP Config>
(AUD_SCK, AUD_MASTER_CLK, PWM1, PWM0)

MIPS_no_EJ_NOR8 : 4'h3 (MIPS as host. No EJ PAD. Byte mode NAND flash.)
MIPS_EJ1_NOR8 : 4'h4 (MIPS as host. EJ use PAD1. Byte mode NAND flash.)
MIPS_EJ2_NOR8 : 4'h5 (MIPS as host. EJ use PAD2. Byte mode NAND flash.)
B51_Secure_no_scramble : 4'hb (8051 as host. Internal SPI flash secure boot, no scramble)
B51_Sesure_scramble : 4'hc (8051 as host. Internal SPI flash secure boot with scarmble)

+3.3V_Normal
AUD_MASTER_CLK
R148 56
C112 100pF 50V
R115 4.7K
R117 4.7K
R123 4.7K OPT
R125 4.7K OPT
R116 4.7K OPT
R118 4.7K OPT
R121 4.7K
R124 4.7K
R126 4.7K
AUD_LRCH
AUD_SCK
AUD_MASTER_CLK_0
PWM1
PWM0

IC101

PCM_D[0-7]
PCM_A[0-14]
PCM_REG
/PCM_OE
/PCM_WE
/PCM_IORD
/PCM_IOWR
/PCM_CE
/PCM_IRQA
/PCM_CD
/PCM_WAIT
PCM_RST
+5V_Normal
R132 10K
R133 10K
C108 0.1uF OPT
C109 0.1uF

/PF_CE0
/PF_CE1
/PF_OE
/PF_WE
PF_ALE
/PF_WP
/F_RB
AR104
AR103
22

S7_NEC_TXD
S7_NEC_RXD
for SYSTEM/HDCP EEPROM&URSA3
I2C_SDA
I2C_SCL
RGB_DDC_SDA
RGB_DDC_SCL
R134 22
R135 22
R136 22
R137 22
R138 22
R139 22

PWM0
PWM1
PWM2
SC_RE2
SC_RE1
TO SCART1

DSUB_DET
MODEL_OPT_3
PCM_5V_CTL
/RST-PHY
3D SG
M_RFModule_RESET

PCM_D0 PCM_D1 PCM_D2 PCM_D3 PCM_D4 PCM_D5 PCM_D6 PCM_D7
PCM_A0 PCM_A1 PCM_A2 PCM_A3 PCM_A4 PCM_A5 PCM_A6 PCM_A7 PCM_A8 PCM_A9 PCM_A10 PCM_A11 PCM_A12 PCM_A13 PCM_A14
PCM_REG_N
PCM_OE_N PCM_WE_N PCM_IORD_N PCM_IOWR_N
PCM_CE_N PCM_IRQA_N PCM_CD_N PCM_WAIT_N PCM_RESET
PCM_PF_CE0Z PCM_PF_CE1Z PCM_PF_OEZ PCM_PF_WEZ PCM_PF_ALE PCM_PF_AD[15] PCM_PF_RBZ
UART_TX2/GPIO65 UART_RX2/GPIO64
DDCR_DA/GPIO71 DDCR_CK/GPIO72
DDCA_DA/UART0_TX DDCA_CK/UART0_RX
PWM0/GPIO66 PWM1/GPIO67 PWM2/GPIO68 PWM3/GPIO69 PWM4/GPIO70
SAR0/GPIO31 SAR1/GPIO32 SAR2/GPIO33 SAR3/GPIO34 SAR4/GPIO35

GPIO143/TCON0 GPIO145/TCON2 GPIO147/TCON4 GPIO149/TCON6 GPIO151/TCON8
5V_DET_HDMI_1 5V_DET_HDMI_2 5V_DET_HDMI_4 SIDEAV_DET
GPIO36/UART3_RX GPIO37/UART3_TX GPIO38 GPIO39 GPIO40 GPIO41 GPIO42
M_REMOTE_RX M_REMOTE_TX ET_RXER FRC_RESET SC1/COMP1_DET ERROR_OUT MODEL_OPT_0
GPIO50/UART1_RX GPIO51/UART1_TX
DC_MREMOTE DD_MREMOTE
3D SG
GPIO6/PM0/INT0 GPIO7/PM1/PM_UART_TX GPIO8/PM2 GPIO9/PM3 GPIO10/PM4 GPIO11/PM5/PM_UART_RX/INT1 PM_SPI_CS1/GPIO12/PM6 PM_SPI_WP1/GPIO13/PM7 PM_SPI_WP2/GPIO14/PM8/INT2 GPIO15/PM9 PM_SPI_CS2/GPIO16/PM10 GPIO17/PM11/INT3 GPIO18/PM12/INT4
USB1_OCD USB1_CTL HP_DET CONTROL_ATTEN MODEL_OPT_6 MODEL_OPT_1 /FLASH_WP MODEL_OPT_2 TUNER_RESET DEMOD_RESET AV_CVBS_DET
R146 33
PM_SPI_CK/GPIO1 GPIO0/PM_SPI_CZ PM_SPI_DI/GPIO2 PM_SPI_DO/GPIO3
SPI_SCK /SPI_CS SPI_SDI SPI_SDO
R147 33 R151 33
for SERIAL FLASH
TS0_CLK TS0_VLD TS0_SYNC
CI_TS_CLK CI_TS_VAL CI_TS_SYNC CI_TS_DATA[0-7]
from CI SLOT
TS0_D0 TS0_D1 TS0_D2 TS0_D3 TS0_D4 TS0_D5 TS0_D6 TS0_D7
CI_TS_DATA[0] CI_TS_DATA[1] CI_TS_DATA[2] CI_TS_DATA[3] CI_TS_DATA[4] CI_TS_DATA[5] CI_TS_DATA[6] CI_TS_DATA[7]
TS1_CLK TS1_VLD TS1_SYNC
FE_TS_CLK FE_TS_VAL_ERR FE_TS_SYNC FE_TS_DATA[0-7]
Internal demod out /External demod in
TS1_D0 TS1_D1 TS1_D2 TS1_D3 TS1_D4 TS1_D5 TS1_D6 TS1_D7
FE_TS_DATA[0] FE_TS_DATA[1] FE_TS_DATA[2] FE_TS_DATA[3] FE_TS_DATA[4] FE_TS_DATA[5] FE_TS_DATA[6] FE_TS_DATA[7]
MPIF_CLK MPIF_CS_N MPIF_BUSY MPIF_D0 MPIF_D1 MPIF_D2 MPIF_D3
Delete /PIF_SPI_CS
R160 1K

S7R

S7R_BASIC S7R_MS10 S7R_DivX S7R_DivX_MS10 S7R_RM

S7MR

S7MR_BASIC S7MR_MS10 S7MR_DivX S7MR_DivX_MS10 S7MR_RM

S7MR-PLUS

S7M-PLUS_BASIC S7M-PLUS_MS10 S7M-PLUS_DivX S7M-PLUS_RM

NAND_FLASH_1G_HYNIX

EAN35669102
IC102-*1
H27U1G8F2BTR-BC

NAND_FLASH_1G_SS

EAN61857001
IC102-*2
K9F1G08U0D-SCB0

NAND_FLASH_1G_TOSHIBA

EAN61508001
IC102-*3
TC58NVG0S3ETA0BBBH

NC_1 NC_2 NC_3 NC_4 NC_5 NC_6 R/B RE CE NC_7 NC_8 VCC_1 VSS_1 NC_9 NC_10 CLE ALE WE WP NC_11 NC_12 NC_13 NC_14 NC_15
NC_16 NC_17 NC_18 NC_19 I/O0 I/O1 I/O2 I/O3 NC_20 NC_21 VCC_2 VSS_2 NC_22 NC_23 NC_24 NC_25 I/O4 I/O5 I/O6 I/O7 NC_26 NC_27 NC_28 NC_29

IC103-*1
CAT24C08WI-GT3-H-RECV(TV)

HDCP_EEPROM_ON_SEMI_NEW

EEPROM_1MBIT_ATMEL
IC104-*1
AT24C1024BN-SH-T

HDCP EEPROM

HDCP_EEPROM_CATALYST_OLD
IC103
CAT24WC08W-T
Addr:10101--
+3.3V_Normal
R113 4.7K
C107 0.1uF
R127 4.7K
R128 22
R129 22
I2C_SCL
I2C_SDA

EEPROM

EEPROM_1MBIT_ST
IC104
M24M01-HRMN6TP
A0'h
C105 0.1uF
C104 8pF OPT
C106 8pF OPT
R111 22
R112 22

I2C

+3.3V_Normal
R140 10K
R141 10K
R142 3.3K
R143 3.3K
R144 2.2K
R145 2.2K
AMP_SDA
AMP_SCL
I2C_SDA
I2C_SCL
NEC_SDA
NEC_SCL

DIMMING

A_DIM
PWM_DIM
R156 10K
R157 100
R155 0 OPT
C111 2.2uF
PWM0
PWM2
LD650 Scan
SCAN_BLK2
R158 100 OPT
FRC_PWM1

THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP3_Saturn7M	DATE	Ver. 0.1
BLOCK	FLASH/EEPROM/GPIO	SHEET	1

MODEL OPTION

PIN NAME	PIN NO.	LOW	HIGH
MODEL_OPT_0	G19	NO FRC	FRC_HW_OPT
MODEL_OPT_4	E18	50/60Hz LVDS	100/120Hz LVDS
MODEL_OPT_1	C5	PHM_OFF	PHM_ON
MODEL_OPT_2	F7	2D	3D
MODEL_OPT_3	B6	HD	FHD
MODEL_OPT_5	D18	Ready	default
MODEL_OPT_6	F9	LCD	OLED

NO_FRC : LOW LOW
U3_INTERNAL : HIGH LOW
U5_EXTERNALBOOT :HIGH HIGH
reserved for FRC : LOW HIGH

OPT_0	OPT_4
LOW	LOW
HIGH	LOW
HIGH	HIGH
LOW	HIGH

--> This option is only applied in EU.
In case of NON_EU, default value set LOW.

-->In case of GP2, This port was used for GIP/NON_GIP

--> MODEL_OPT_5, MODEL_OPT_6
: Only 3D_SG GPIO OUTPUT CONTROL

RSDS Power OPT

VDDC 1.26V

VDDC : 2026mA

Normal Power 3.3V

Normal 2.5V

DDR3 1.5V

S7M-PLUS_DivX_MS10 IC101 LGE107DC-RP [S7M+ DIVX/MS10]

Close to MSTAR

ANALOG SIF Close to MSTAR

TU/DEMOD_I2C

B/T USB

SIDE USB

I2S_I/F

AUDIO IN

AUDIO OUT

HDMI

DSUB

SCART1_RGB/COMP1

COMP2

CVBS In/OUT

Delete CHB_CVBS_IN

H/P OUT

RSDS Power OPT

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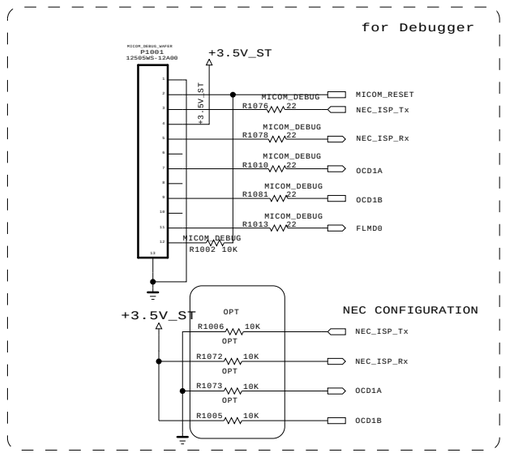
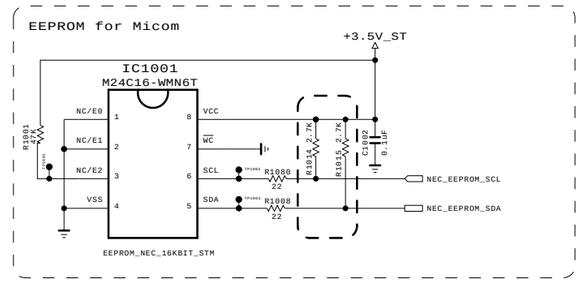
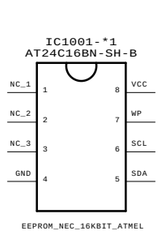
SECRET
LGElectronics

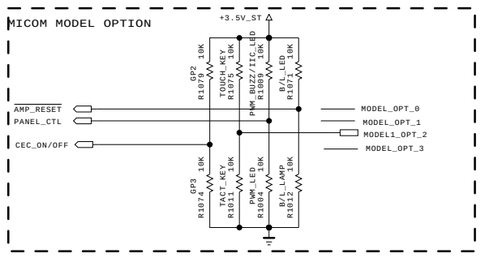
LG ELECTRONICS

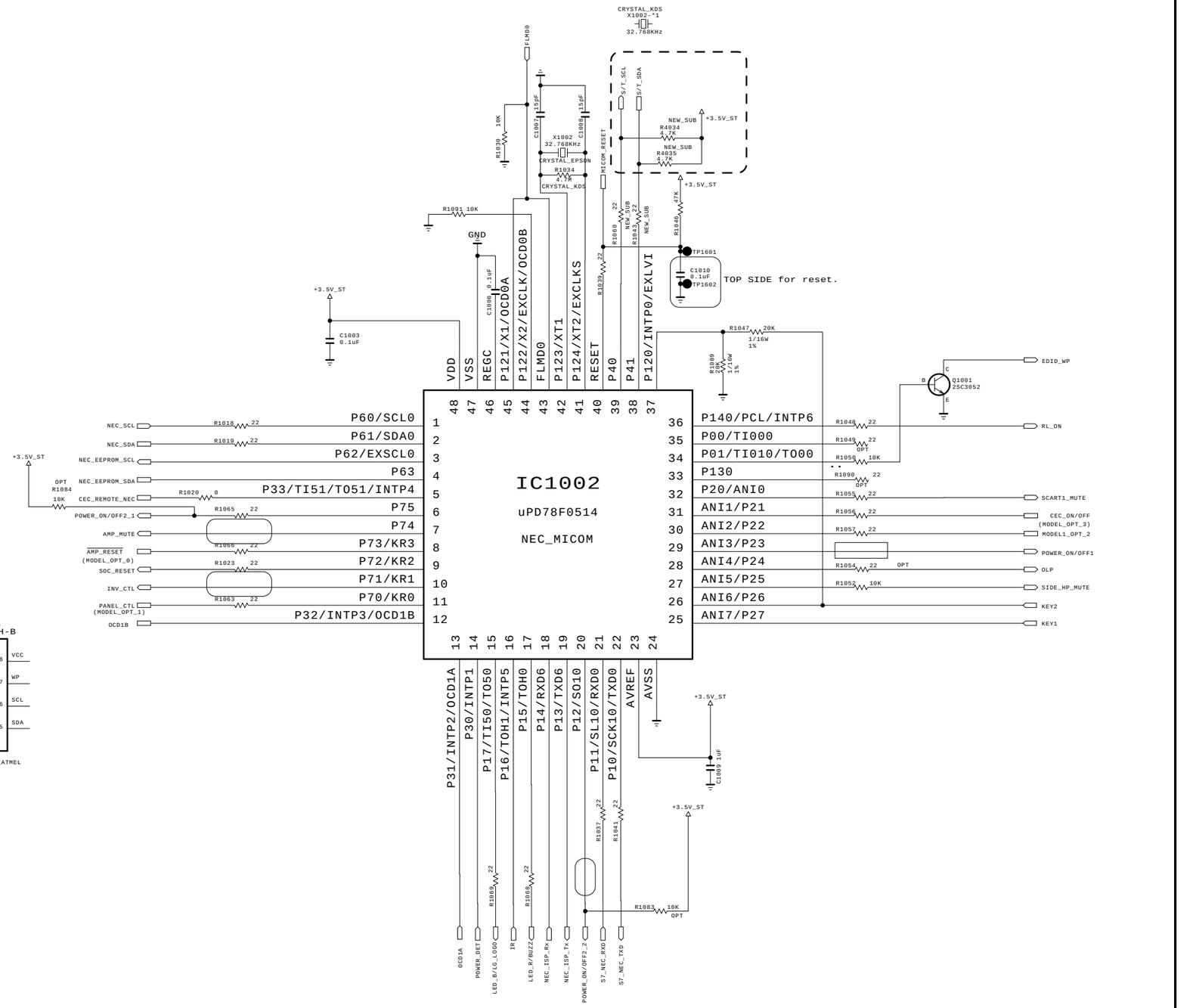
MODEL	GP2R	DATE	20101023
BLOCK	MAIN2, HW OPT	SHEET	2 /











2011Y,GP2R, 101125 Update

MODEL OPTION

PIN NAME	PIN NO.	HIGH	LOW
MODEL_OPT_0	8	B/L_LED	B/L_LAMP
MODEL_OPT_1	11	PWM_BUZZ/IIC_LED	PWM_LED
MODEL_OPT_2	30	TOUCH_KEY	TACT_KEY
MODEL_OPT_3	31	GP2	GP3

PWM_BUZZ/IIC_LED :Using IIC for LED Breathing & PWM Buzz
PWM_LED : Using PWM Signal for LED Lighting

MODEL_OPT_0	MODEL_OPT_1	MODEL_OPT_2	MODEL_OPT_3	Description
LOW	LOW	LOW	LOW	LK330/LK430 for KR/US 10Y EYE-Q Sensor KEY & PWM LED & No Buzz & No LED Blink
LOW	LOW	LOW	HIGH	LK330/LK430/LK530 KEY & PWM LED & No Buzz & No LED Blink
LOW : LED HIGH : LAMP	HIGH	HIGH	LOW	LV25/LV35/LV45/LW45/LV55/LK45/LK55 S/T & IIC LED & NO BUZZ & LED Blink
	HIGH	LOW	LOW	TBD IIC LED(09Y IIC Protocol) & No BUZZ
	LOW	HIGH	LOW	TBD S/T & IIC LED & No Buzz & LED Blink

2010Y,GP2

MODEL OPTION

PIN NAME	PIN NO.	HIGH	LOW
MODEL_OPT_0	8	B/L_LED	B/L_LAMP
MODEL_OPT_1	11	PWM_BUZZ/IIC_LED	PWM_LED
MODEL_OPT_2	30	TOUCH_KEY	TACT_KEY
MODEL_OPT_3	31	GPIO_LED	NON_GPIO_LED

PWM_BUZZ/IIC_LED : For model that use LED Lighting used IIC
PWM_LED : For model that use LED Lighting used PWM Signal

MODEL_OPT_0	MODEL_OPT_1	MODEL_OPT_2	MODEL_OPT_3	
LOW	LOW	LOW	LOW	LD350/450/550 PWM LED & No Buzz & No LED Blink
HIGH	LOW	HIGH	LOW	19/22/26LE5300/5300 IIC LED & PWM IIC BUZZ
HIGH	HIGH	HIGH	LOW	32/37/42/47/55LE5300 IIC LED & PWM BUZZ
LOW	HIGH	LOW	LOW	LD420 IIC LED(09Y IIC Protocol) & No BUZZ
HIGH	LOW	LOW	HIGH	LE7300 GPIO LED & NO BUZZ

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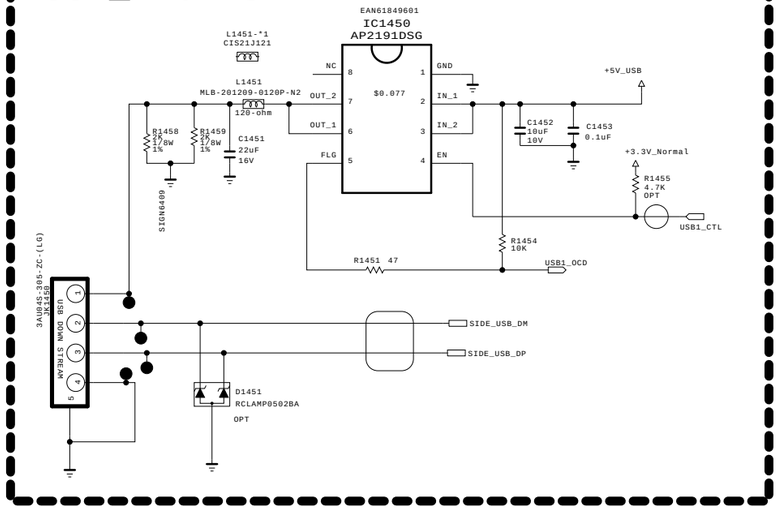
SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101125
BLOCK	MICOM Rev.4	SHEET	5

USB_DIODES



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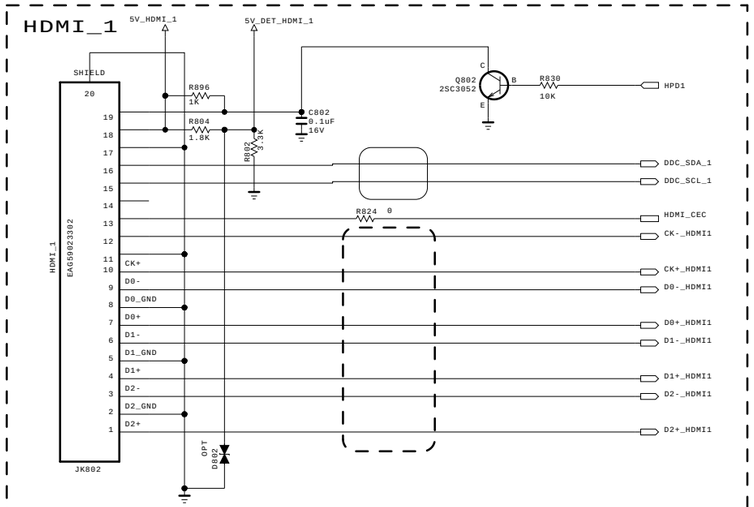
SECRET
LGElectronics

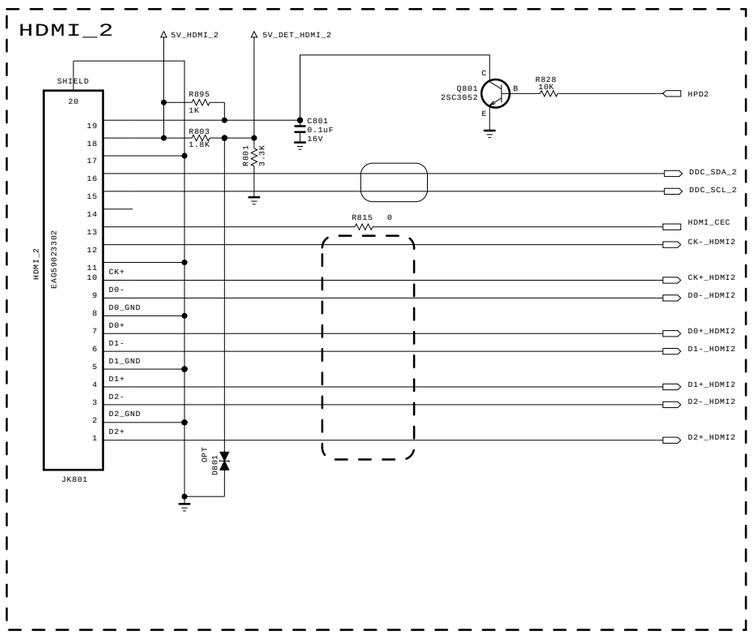
LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	USB_OCP_DIODE	SHEET	7 /

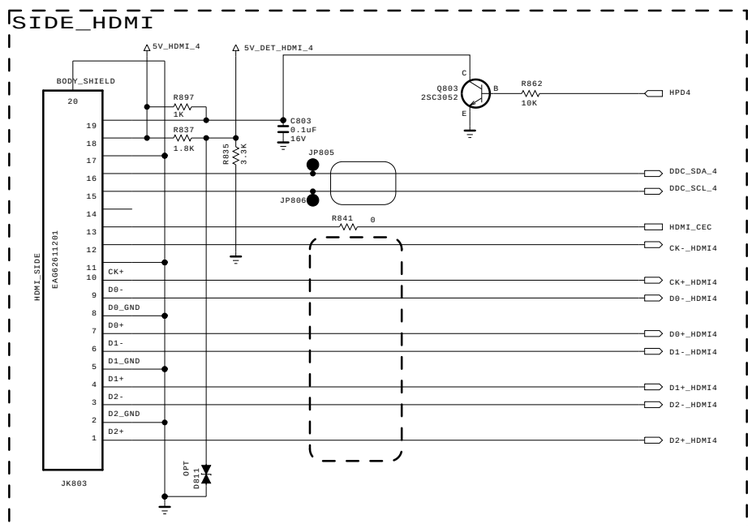
HDMI_1



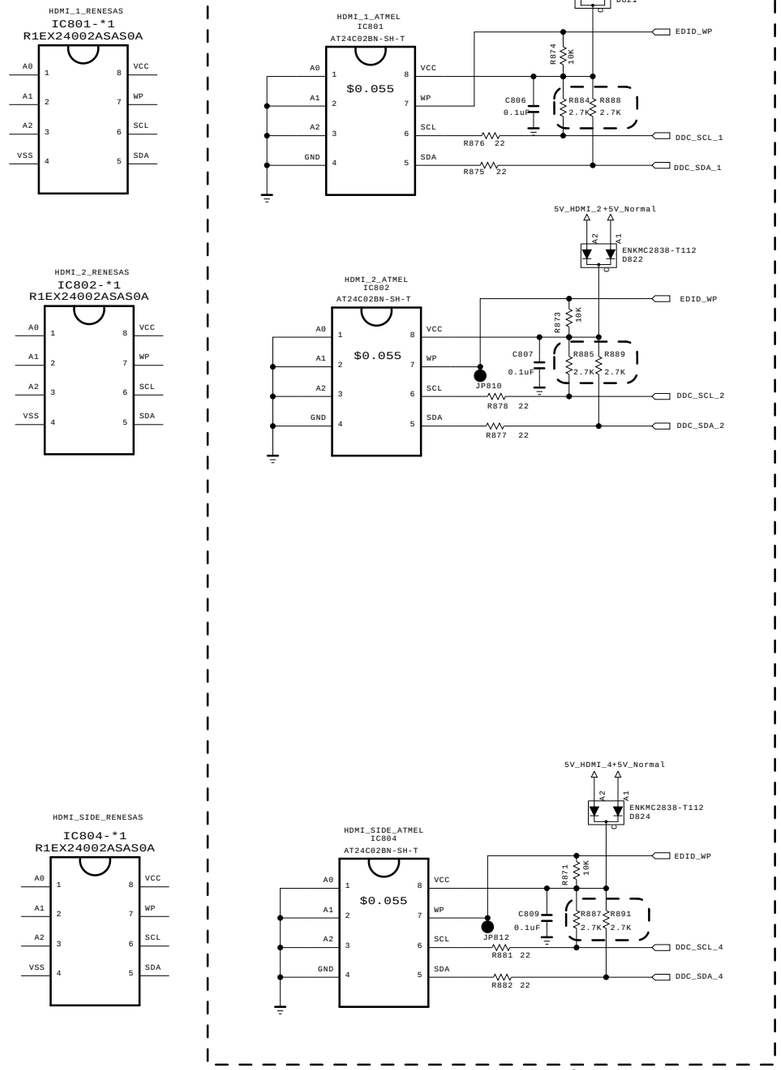
HDMI_2



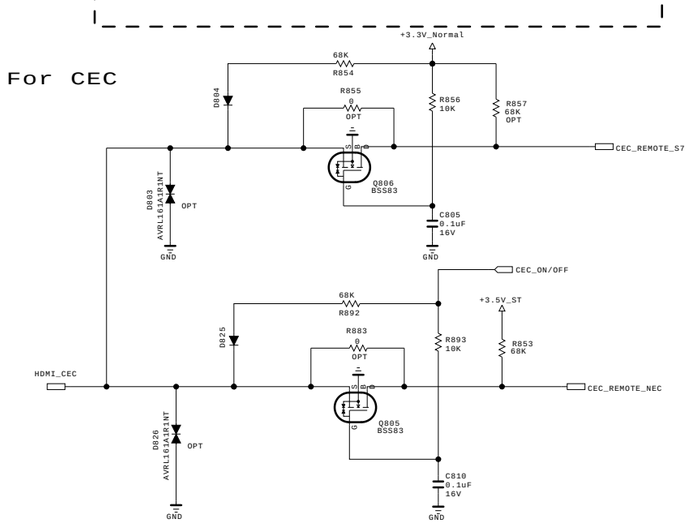
SIDE_HDMI



HDMI EEPROM



For CEC



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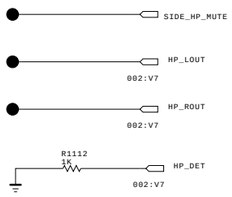
LGElectronics

LG ELECTRONICS

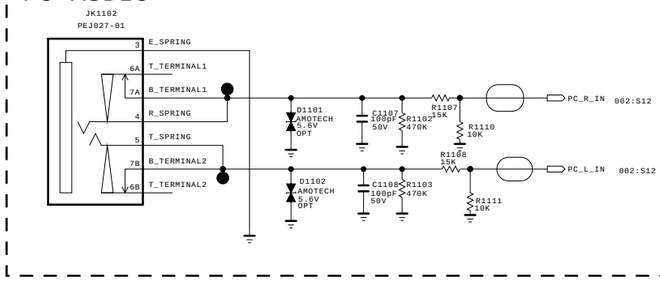
MODEL	GP2R	DATE	20101023
BLOCK	HDMI	SHEET	8

RGB/SPDIF/PC/HP



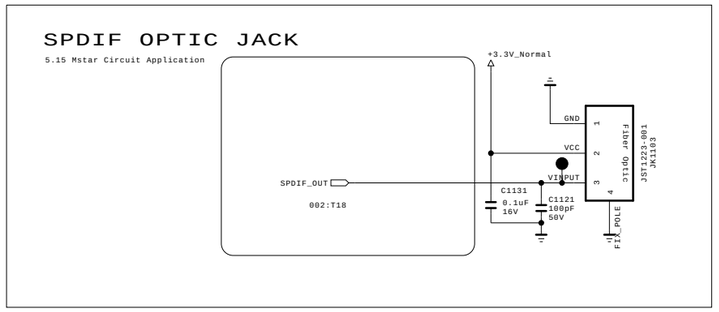
HP_DET Default Low

PC AUDIO

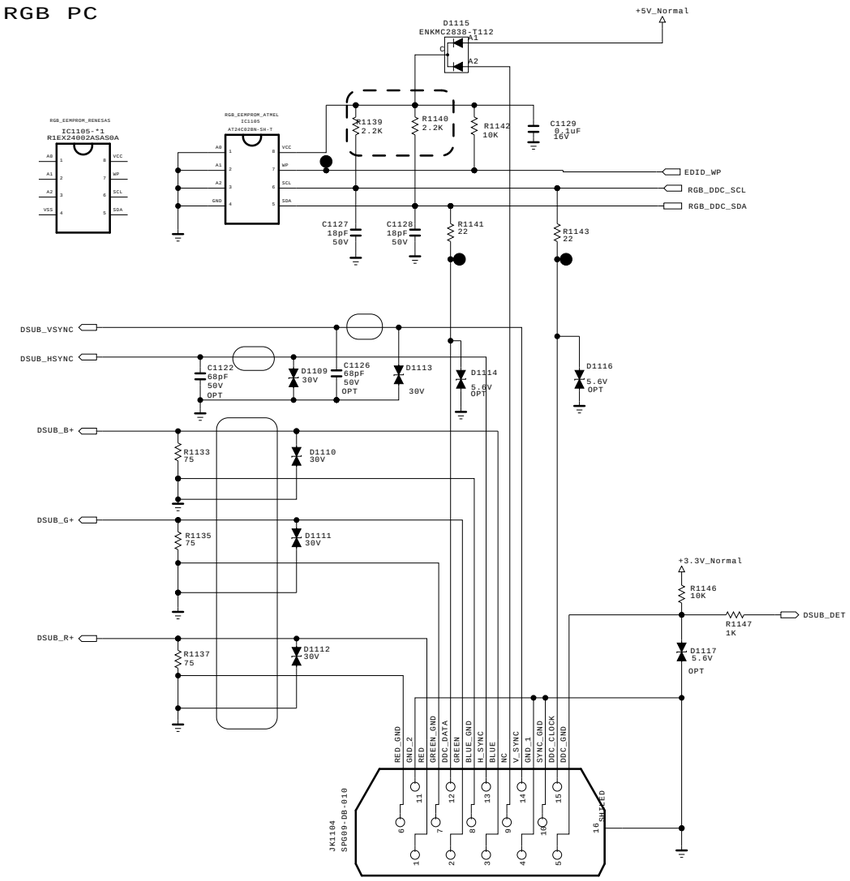


SPDIF OPTIC JACK

5.15 Mstar Circuit Application



RGB PC



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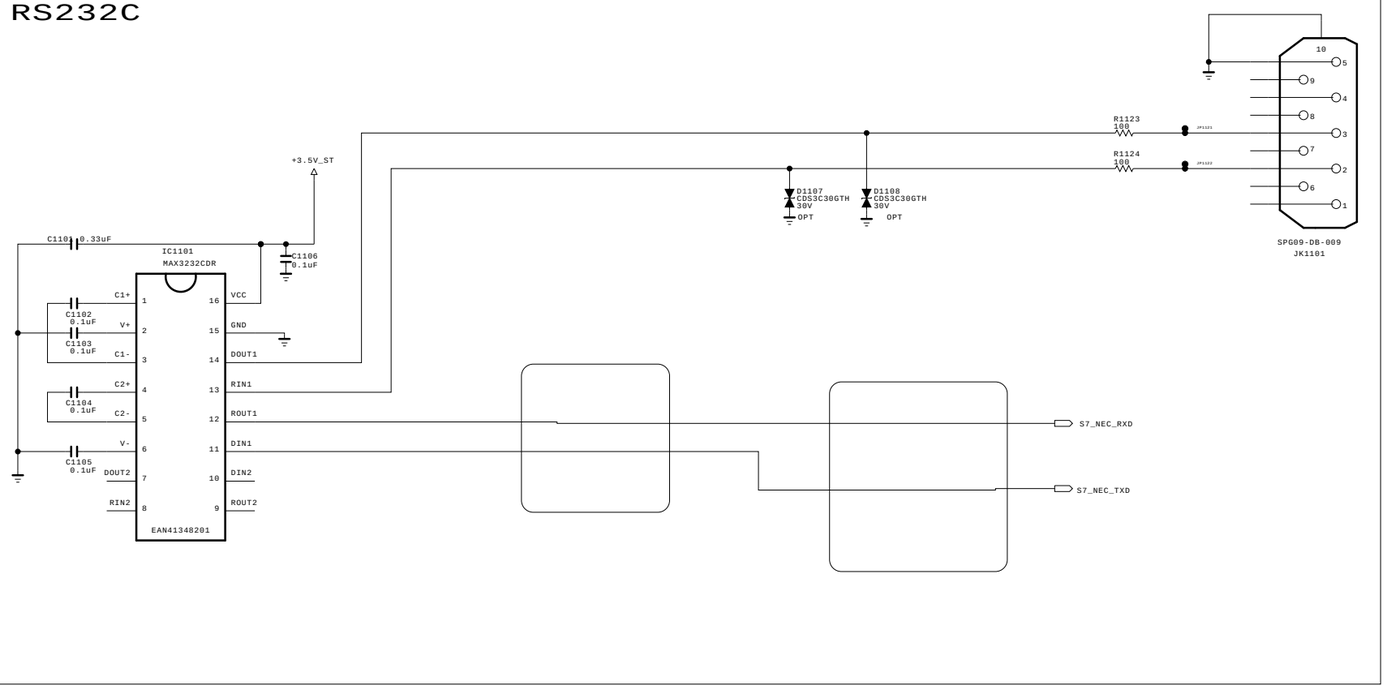
SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	RGB/SPDIF/HP	SHEET	9

RS232C



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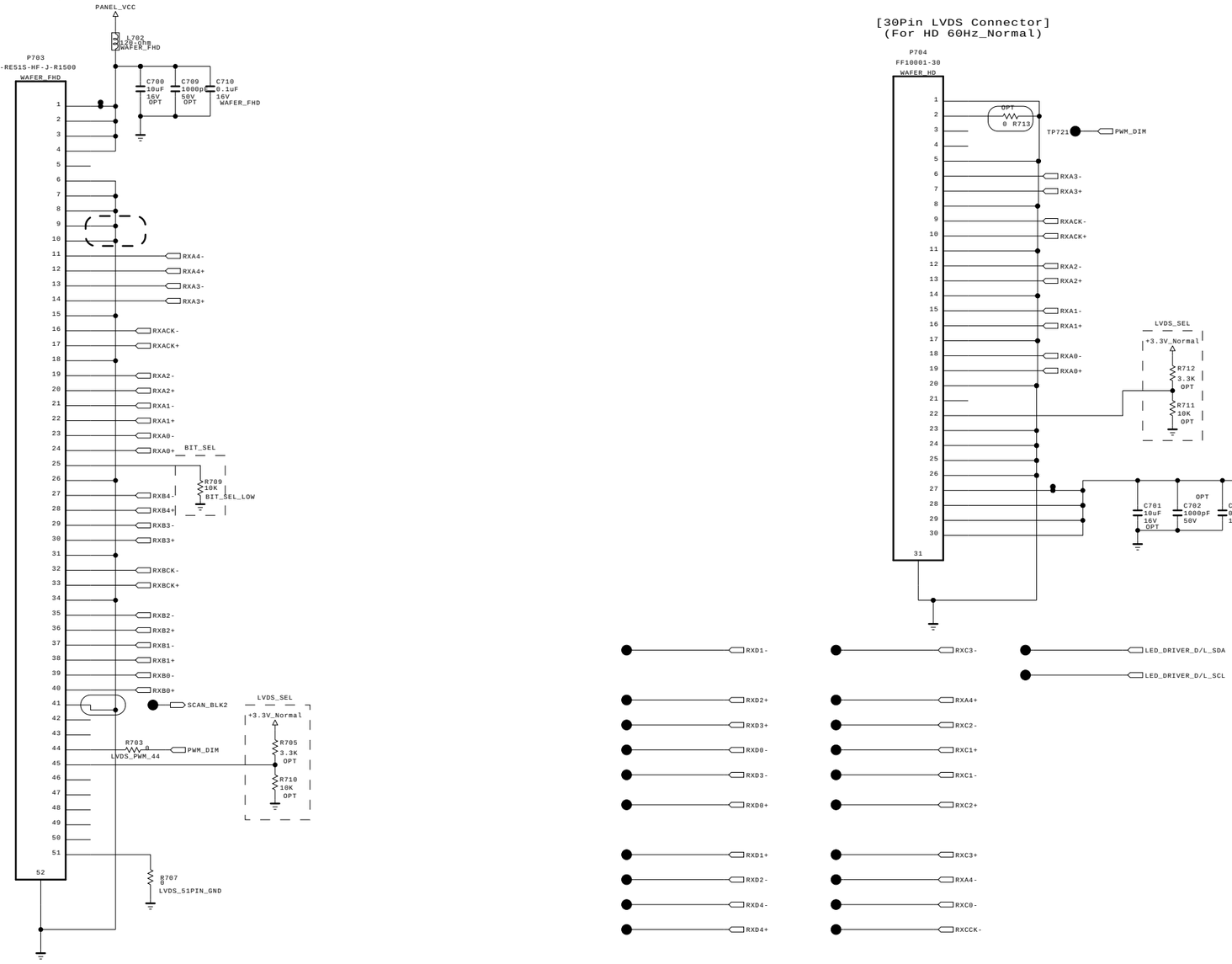
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	RS232C_9PIN	SHEET	10

[51Pin LVDS Connector]
(For FHD 60/120Hz)



[30Pin LVDS Connector]
(For HD 60Hz_Normal)

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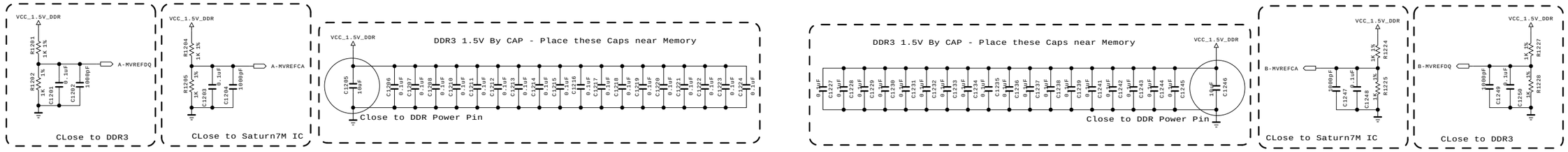
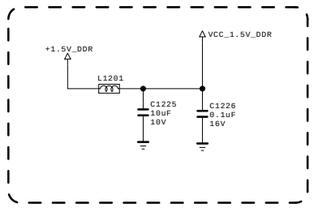
SECRET

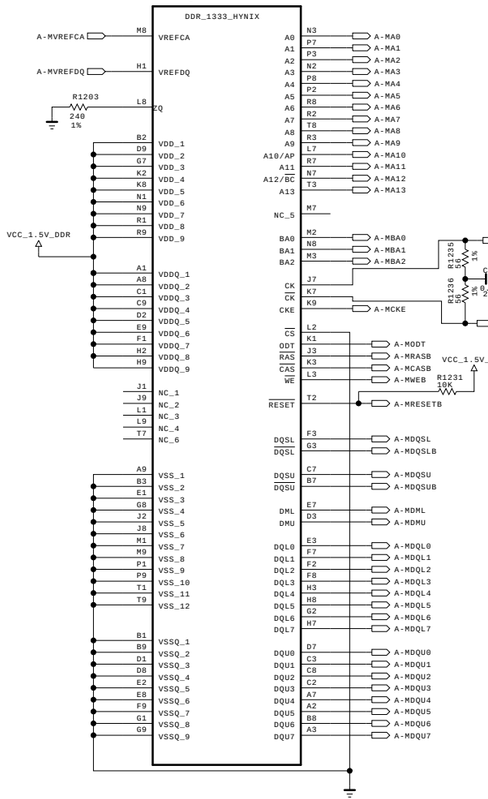
LGElectronics

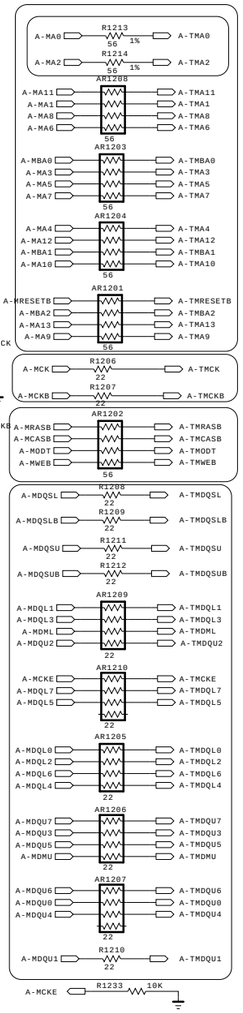
LG ELECTRONICS

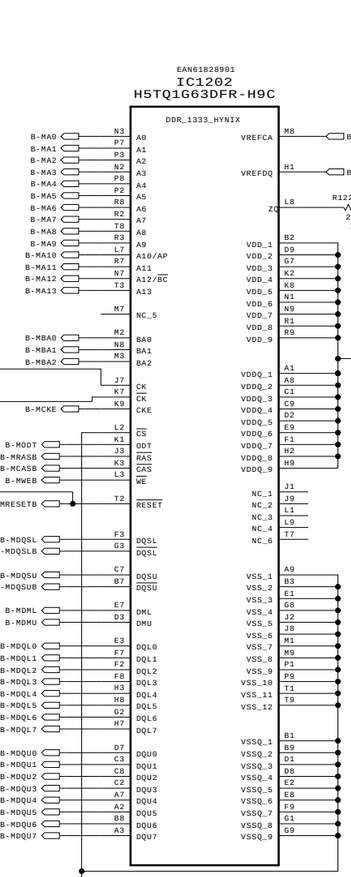
MODEL	GP2R	DATE	20101023
BLOCK	LVDS_LARGE	SHEET	11

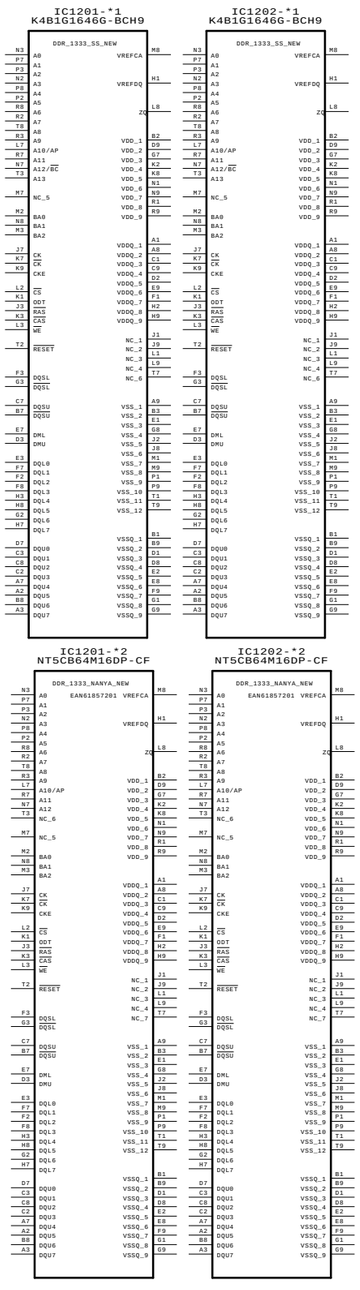












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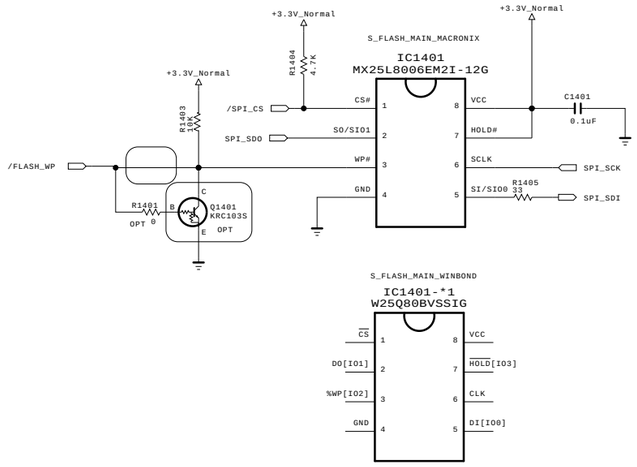
SECRET

LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	DDR_256	SHEET	12 /



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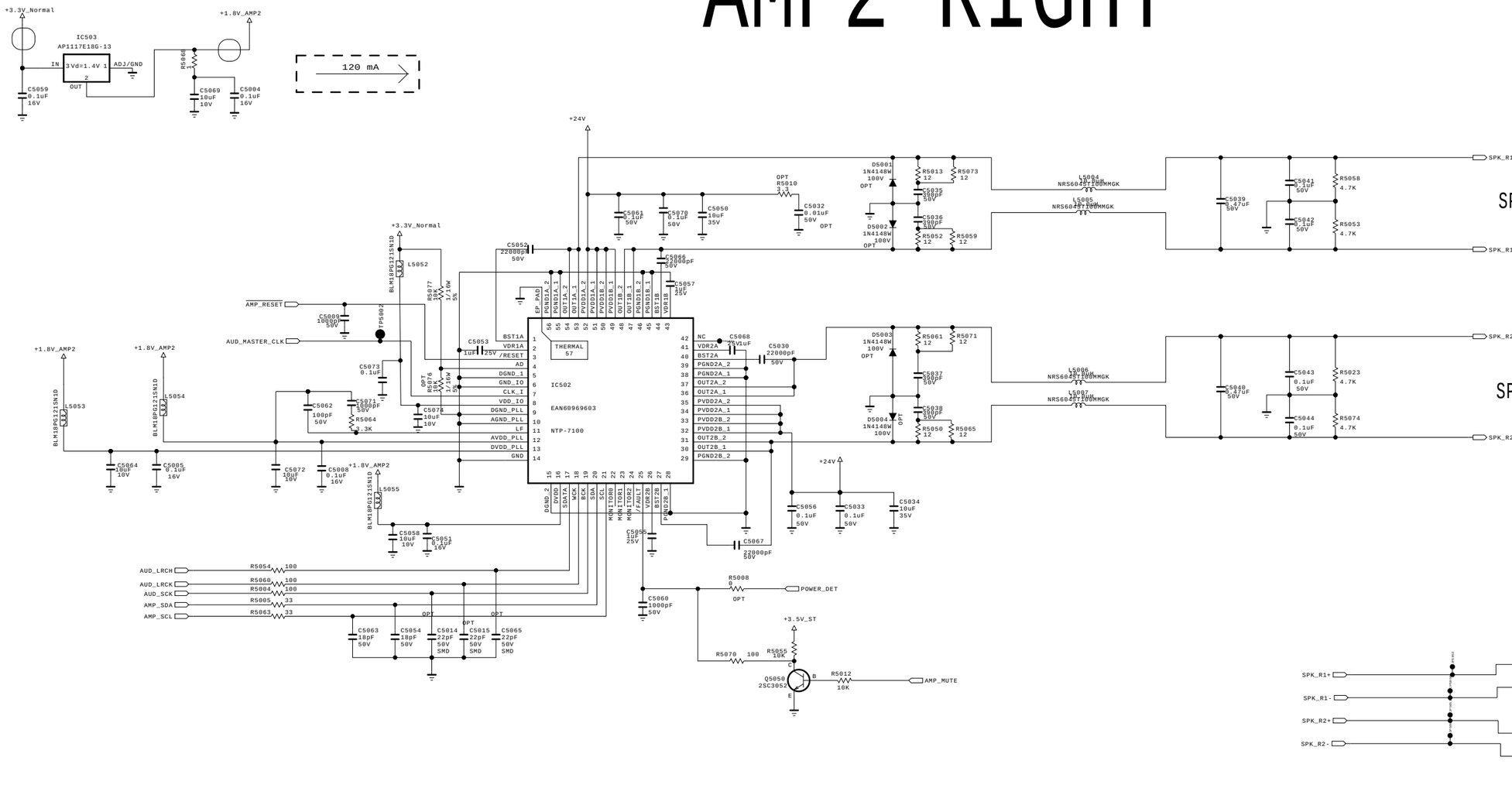
SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	SFLASH_1MB	SHEET	13 /

AMP2 RIGHT



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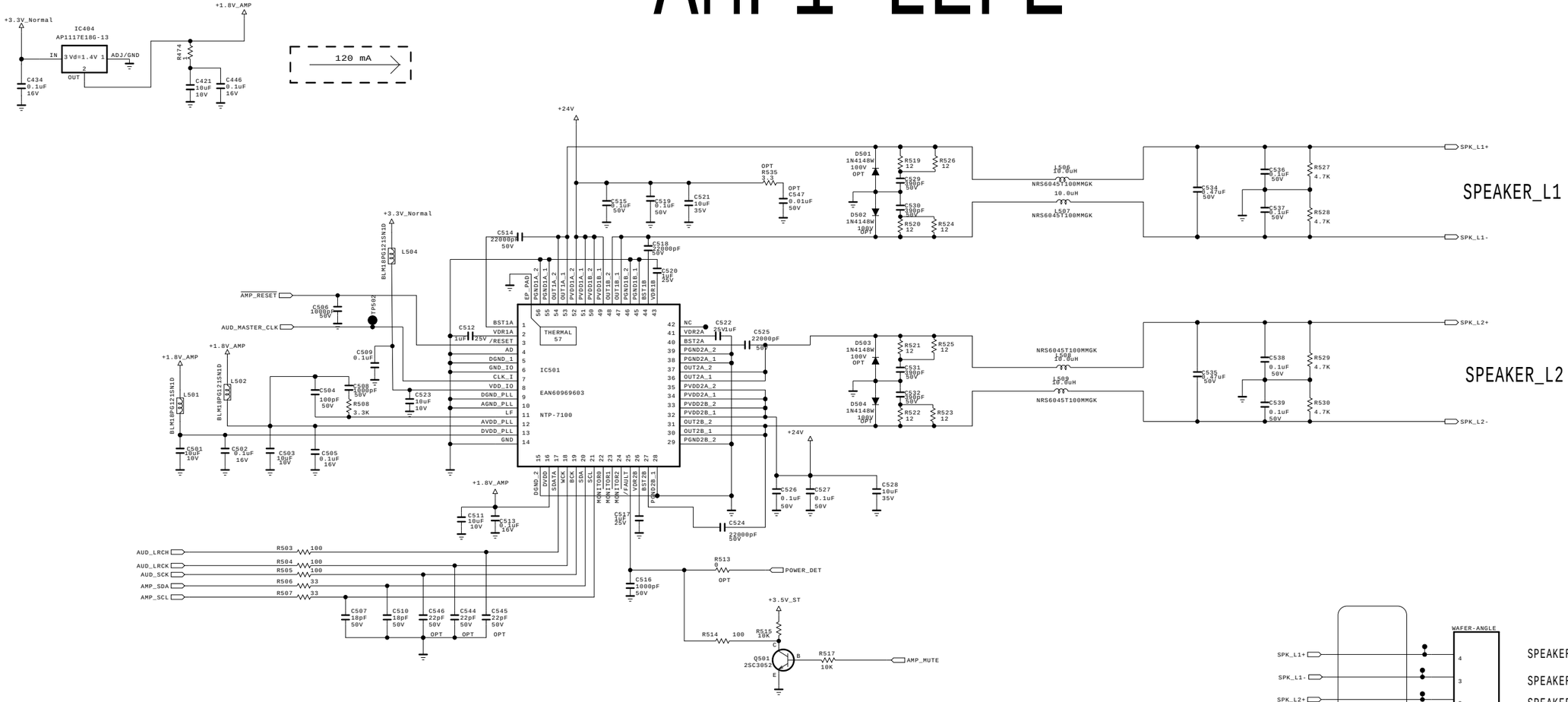
SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	WOOFER_NTP	SHEET	15 /

AMP1 LEFE



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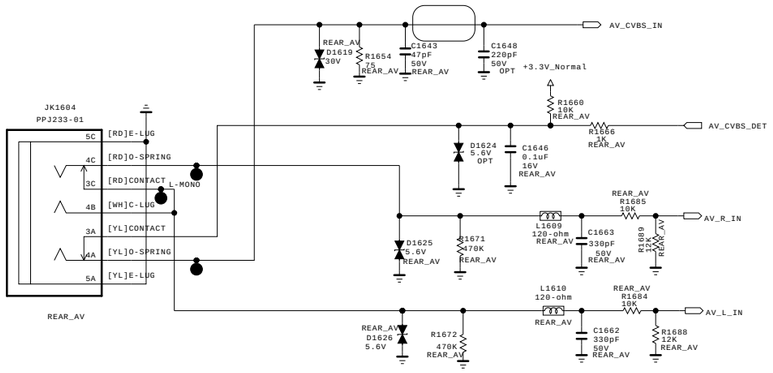
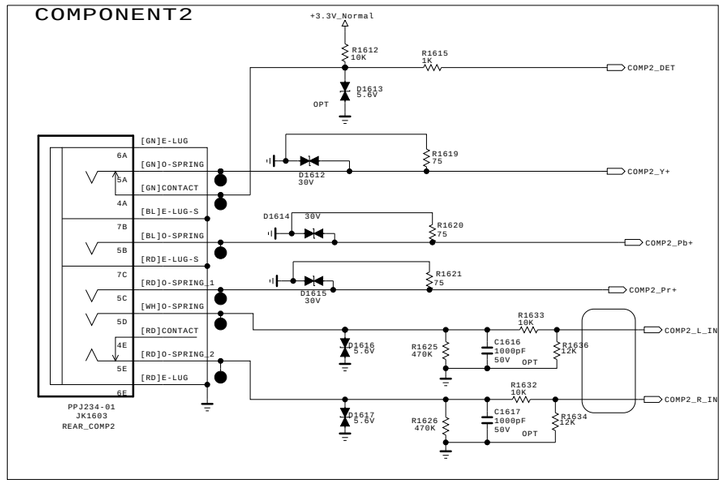
SECRET
LGElectronics

LG ELECTRONICS

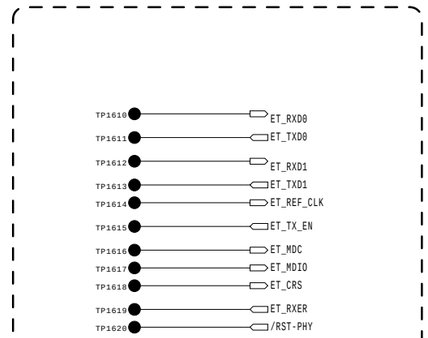
MODEL	GP2R	DATE	20101023
BLOCK	AMP_NTP	SHEET	16 /

Rear AV





ETHERNET FOR DVB_T2



REC_8
SC1/COMP1_DET
SC1_CVBS_IN
SC1_FB
REC_8
SC1_ID
SC1/COMP1_L_IN
SC1/COMP1_R_IN
SCART1_MUTE

SCART1_Rout
DTV/MNT_VOUT
SCART1_Lout
SC_RE2
SC_RE1

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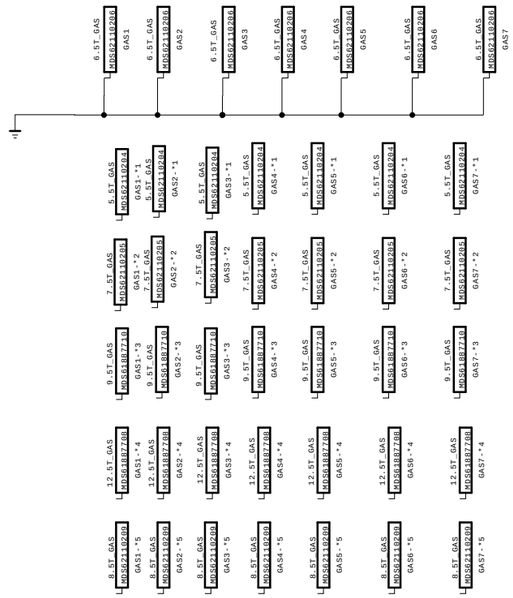
SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	REAR_JACK	SHEET	17 /

SMD GASKET



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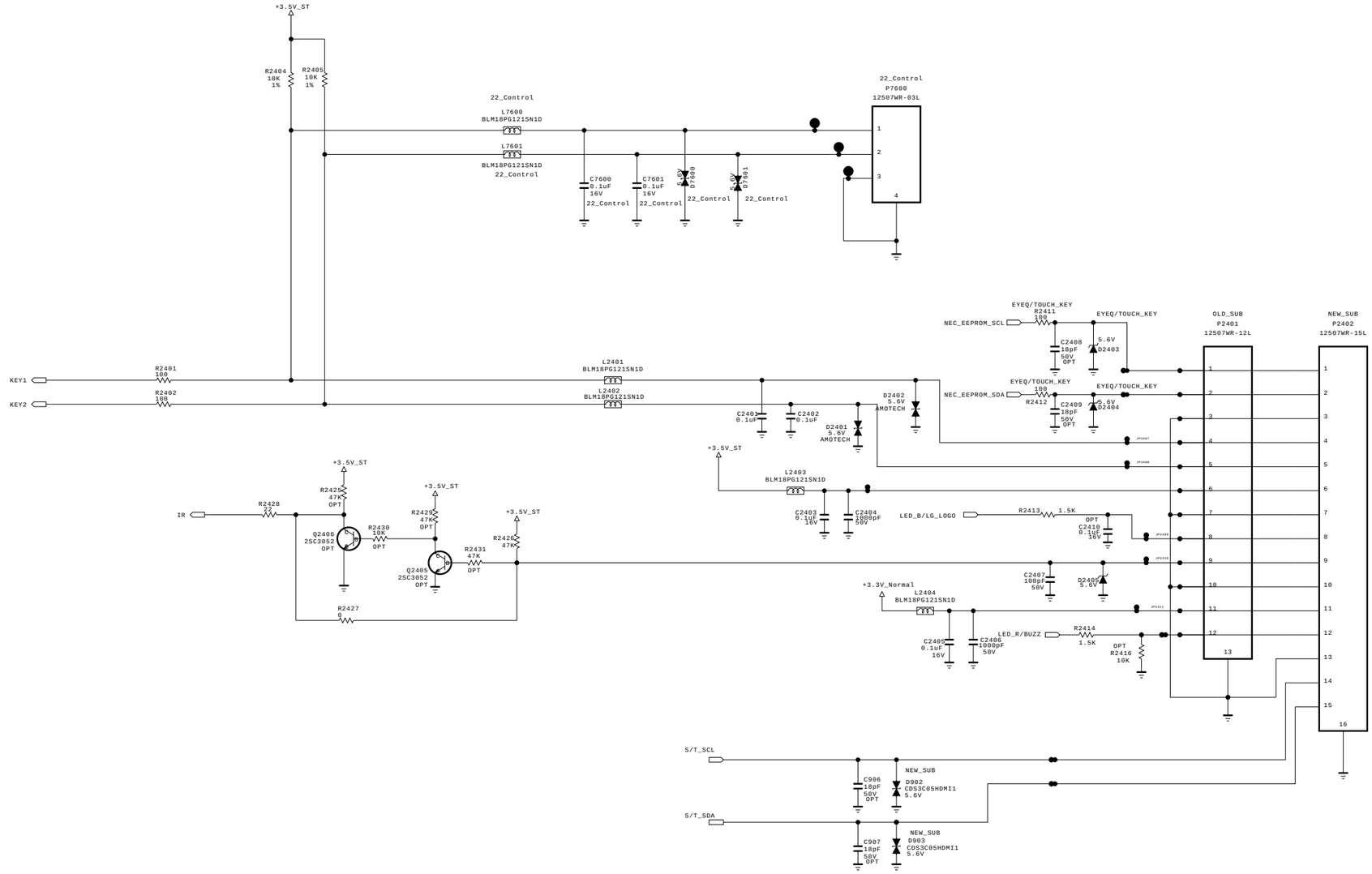
SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	SMD_GAS	SHEET	20 /

CONTROL

IR & LED



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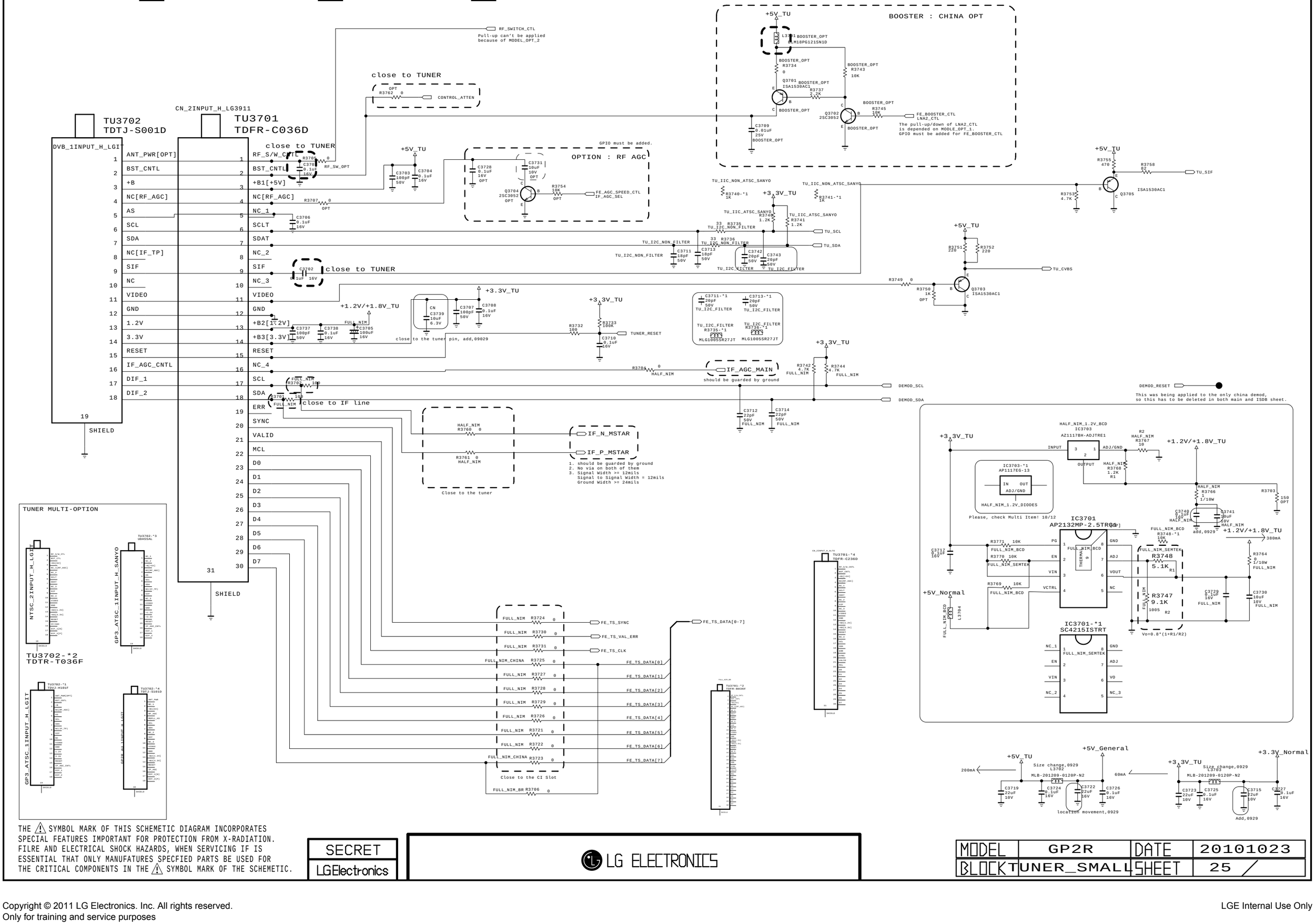
SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	IR/CONT_SMALL	SHEET	23 /

GP2R_GLOBAL_TUNER_BLOCK for Small Model



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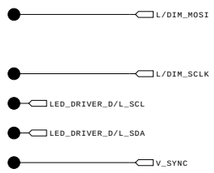
SECRET
LGElectronics

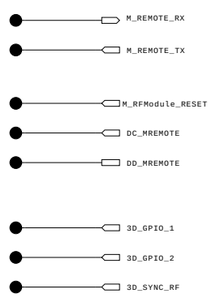
LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	TUNER_SMALL	SHEET	25

NON_L/DIM_LED/DRIVER



NON_3D_SG



THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

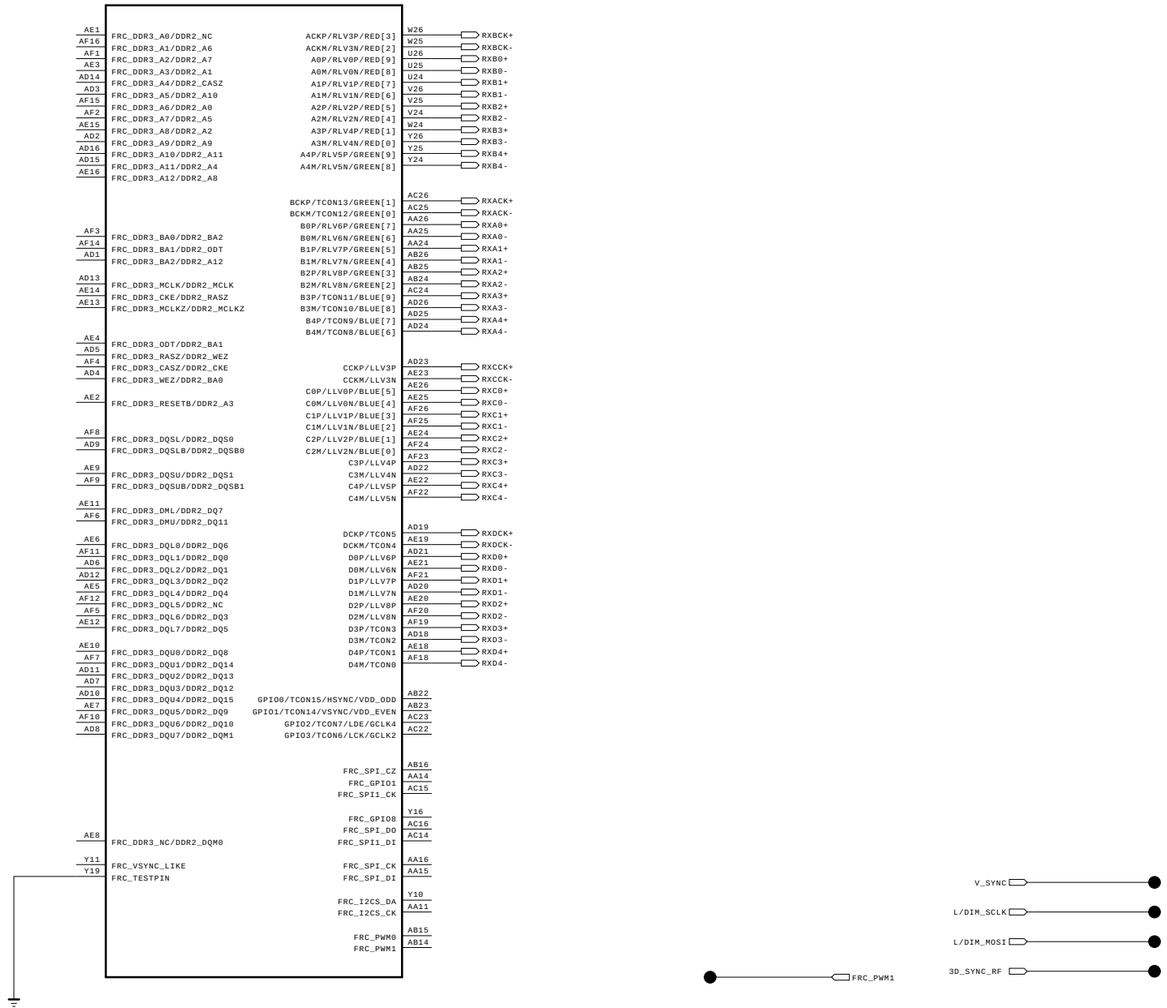
LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	NON_L/DIM	SHEET	26 /

S7M-PLUS

IC101

LGE107DC-RP [S7M+ DIVX/MS10]



THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

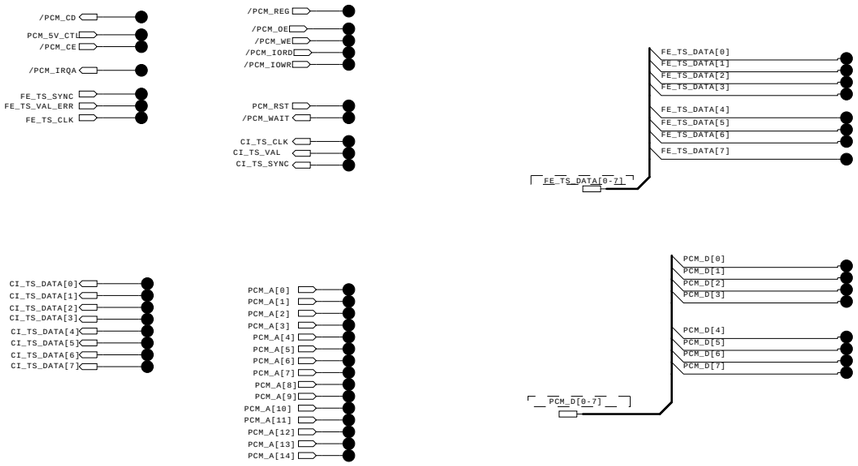
SECRET

LGElectronics

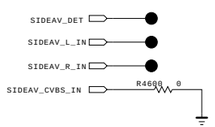
LG ELECTRONICS

MODEL		DATE	
BLOCK		SHEET	/

NON CI Region



NON Side AV

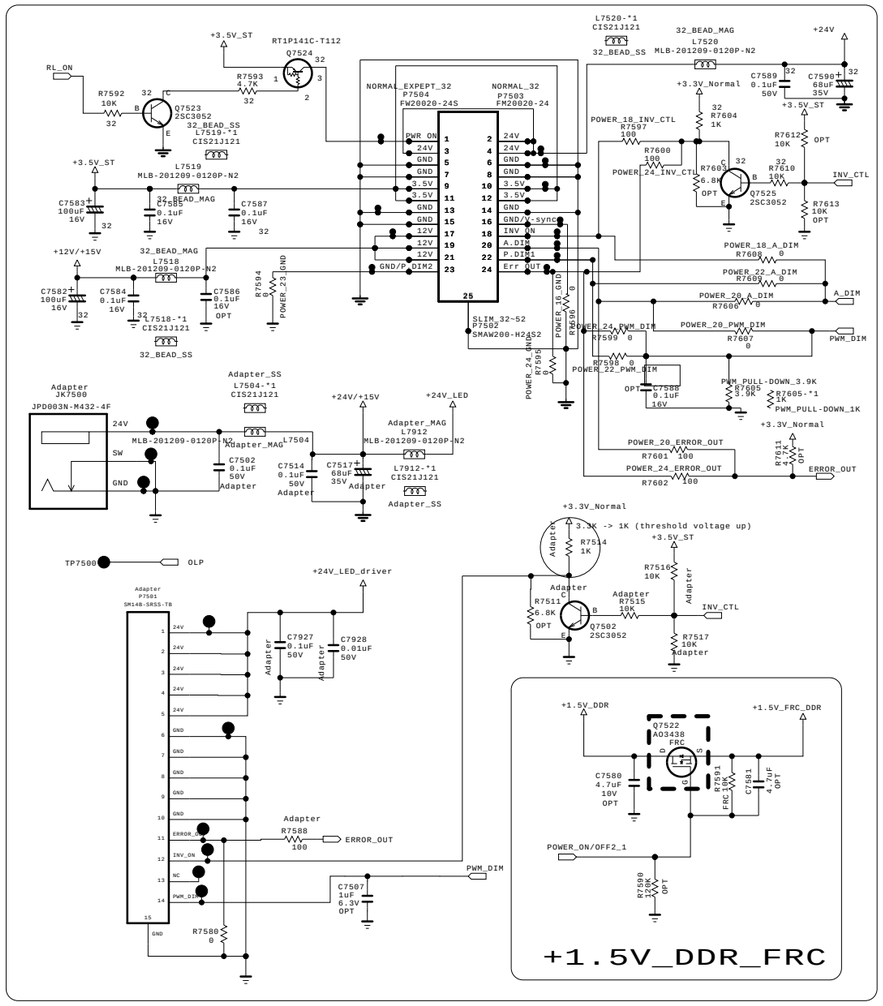


THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	Ver. 1.0
BLOCK	NON_Option	SHEET	35



THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

MODEL	GP2R	DATE	20101023
BLOCK	POWER_SMALL	SHEET	36 /


LG Electronics Inc.

LCD TV Repair Guide III
`11 years New Models (GP2R MSTAR)
Trouble Shooting Guide

1. Trouble Shooting

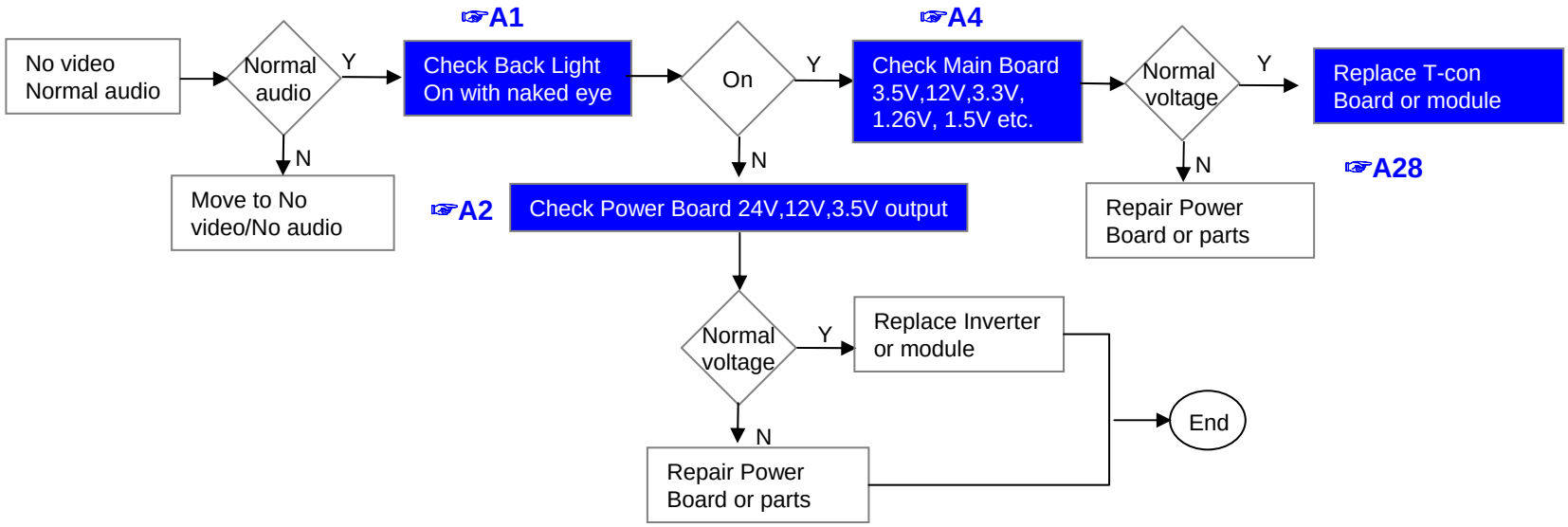
Contents of LCD TV Standard Repair Process

No.	Error symptom (High category)	Error symptom (Mid category)	Page	Remarks
1	A. Video error	No video/Normal audio	1	
2		No video/No audio	2	
3		Video error, video lag/stop	3	
4		Color error	4	
5		Vertical/Horizontal bar, residual image, light spot, external device color error	5	
6	B. Power error	No power	6	
7		Off when on, off while viewing, power auto on/off	7	
8	C. Audio error	No audio/Normal video	8	
9		Wrecked audio/discontinuation/noise	9	
10	D. Function error	No response in remote controller, key error, recording error, memory error	10	
11		External device recognition error	11	
12	E. Noise	Circuit noise, mechanical noise	12	
13	F. Exterior error	Exterior defect	13	

Standard Repair Process

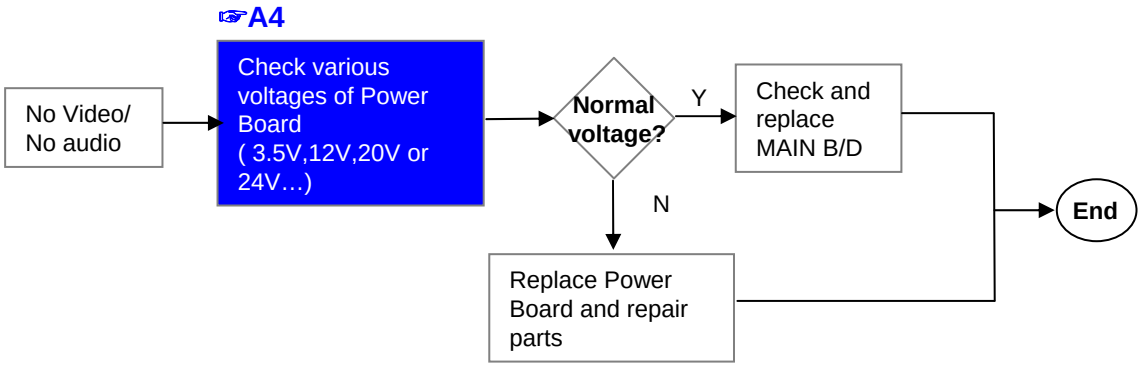
LCD TV	Error symptom	A. Video error	Established date		
		No video/ Normal audio	Revised date		1/13

First of all, Check whether all of cables between board is inserted properly or not.
(Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,,)

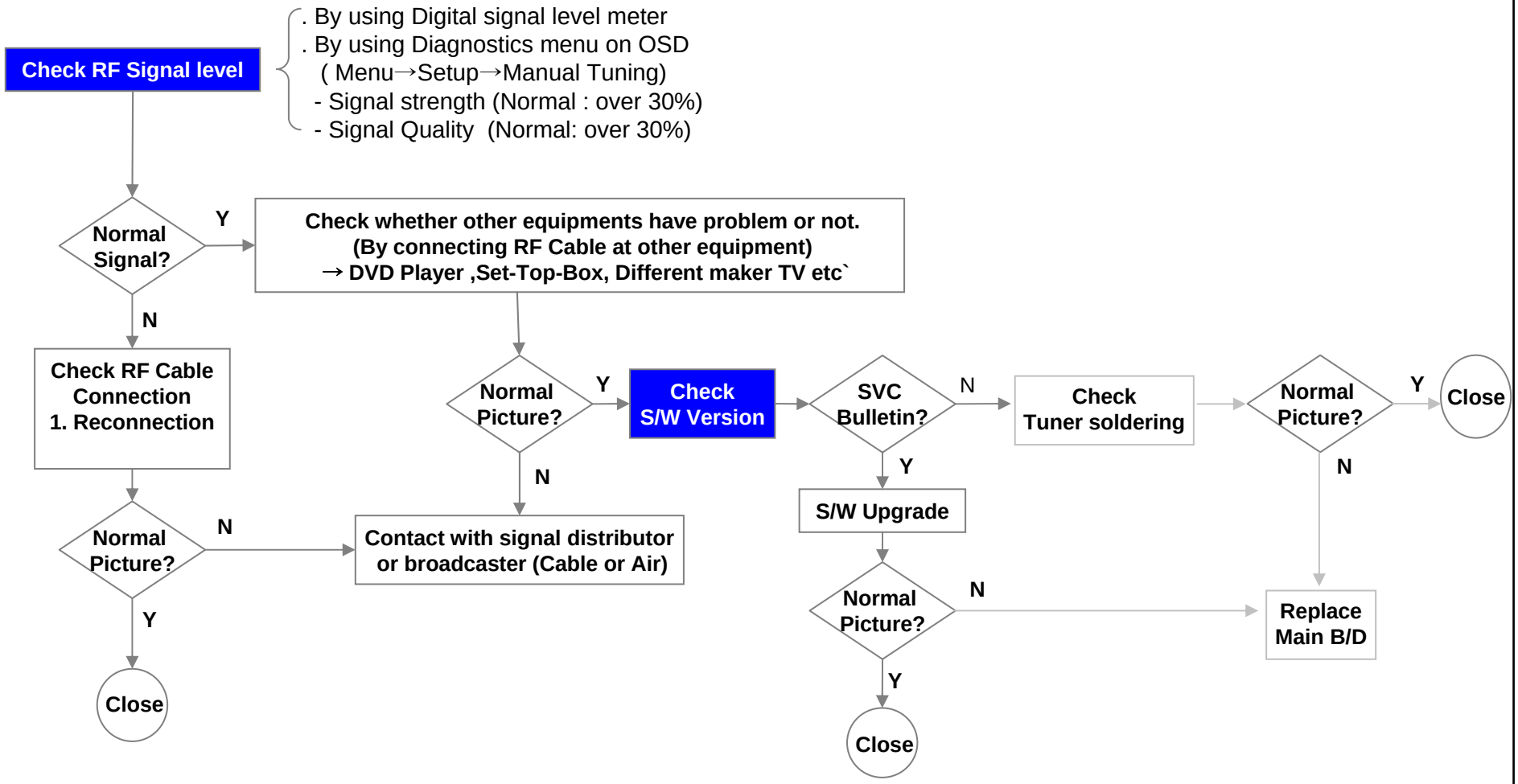


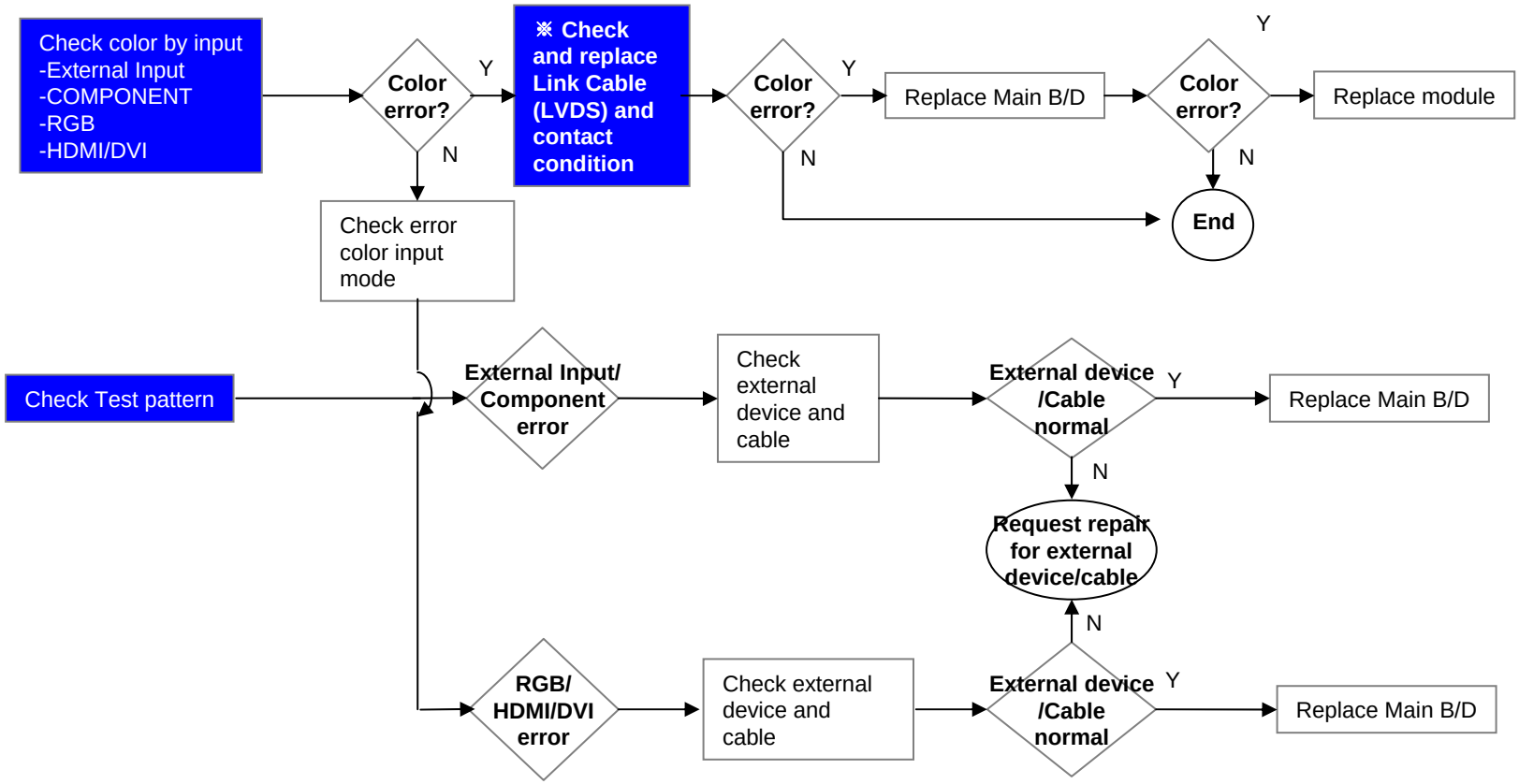
※Precaution ☞A7 & A3

LCD TV	Error symptom	A. Video error	Established date		
		No video/ No audio	Revised date		2/13

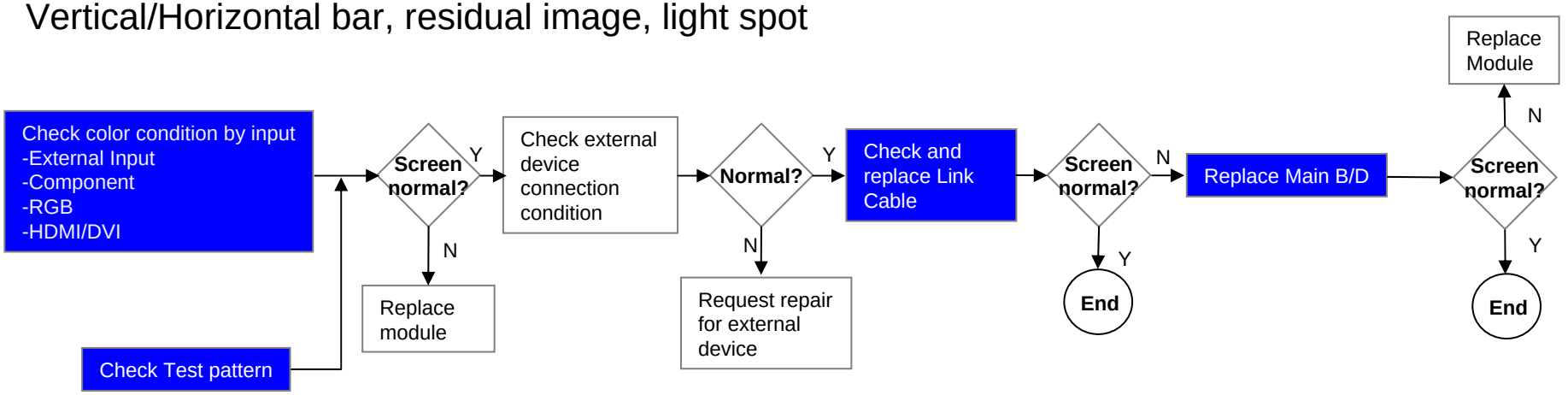


LCD TV	Error symptom	A. Picture Problem	Established date		
		Picture broken/ Freezing	Revised date		3/13

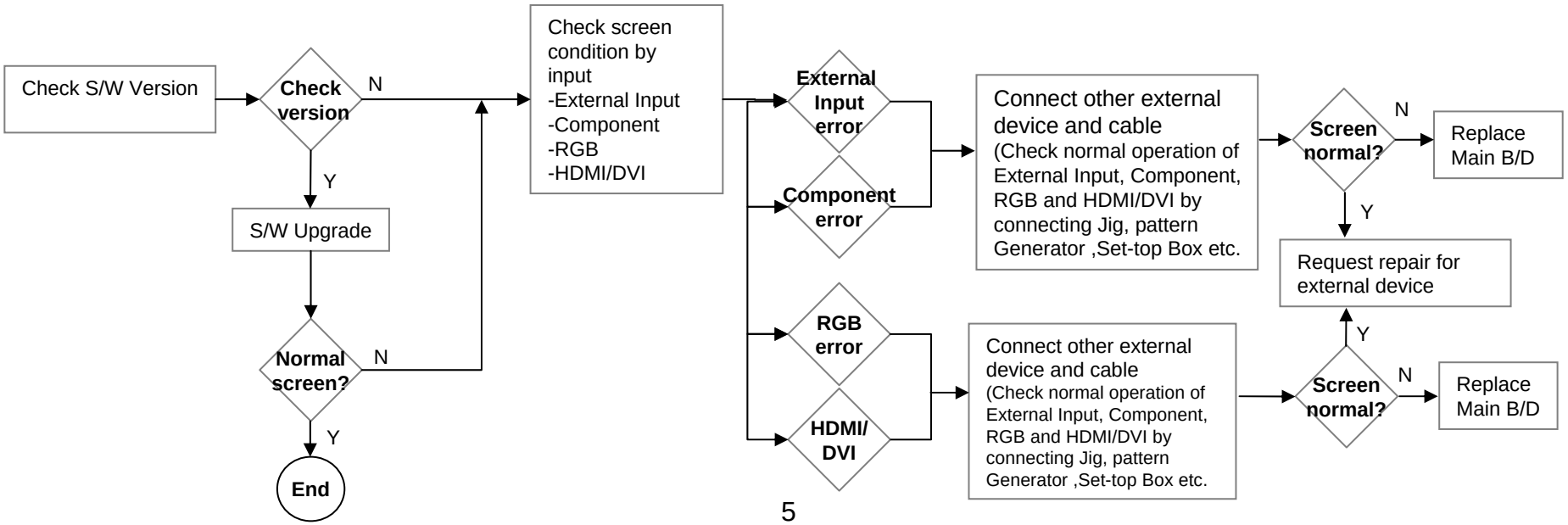




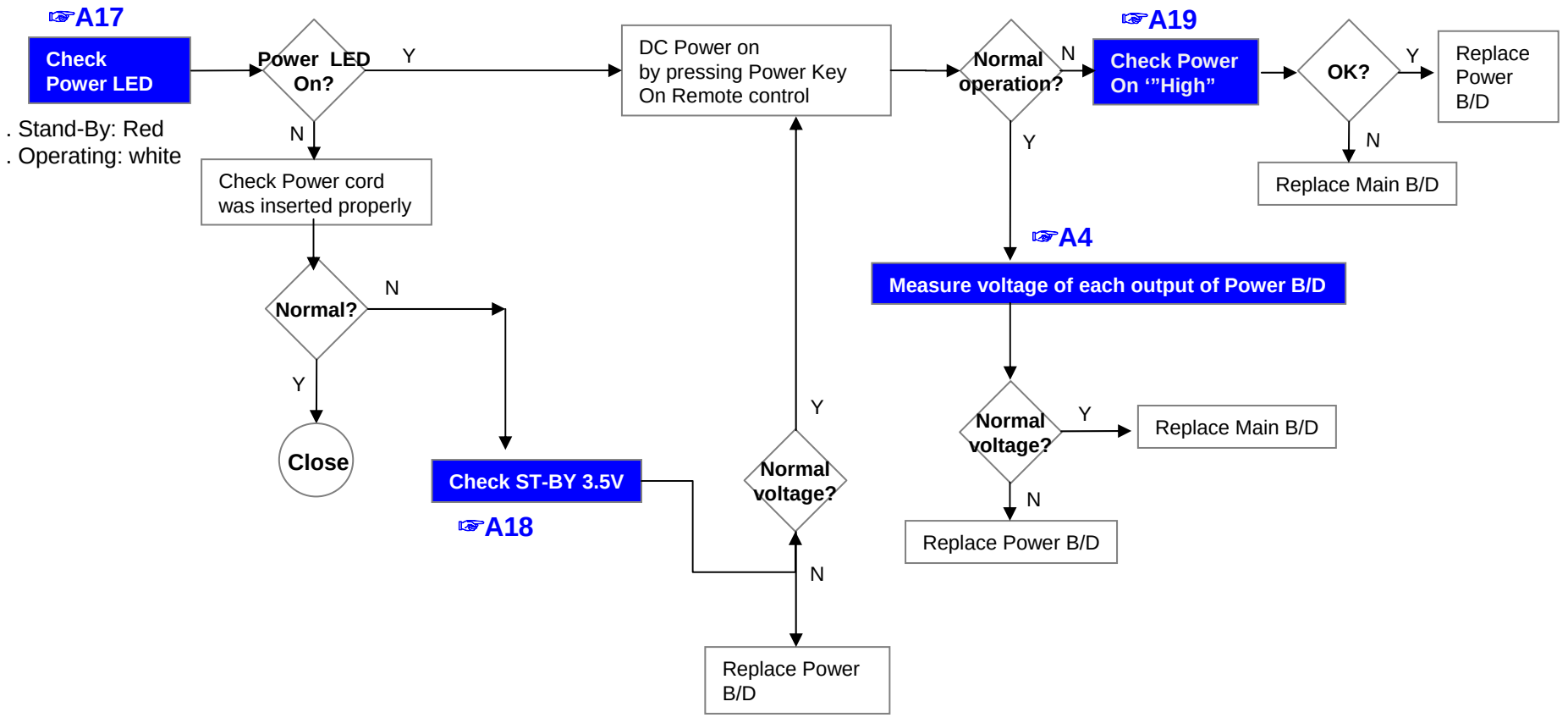
Vertical/Horizontal bar, residual image, light spot



External device screen error-Color error

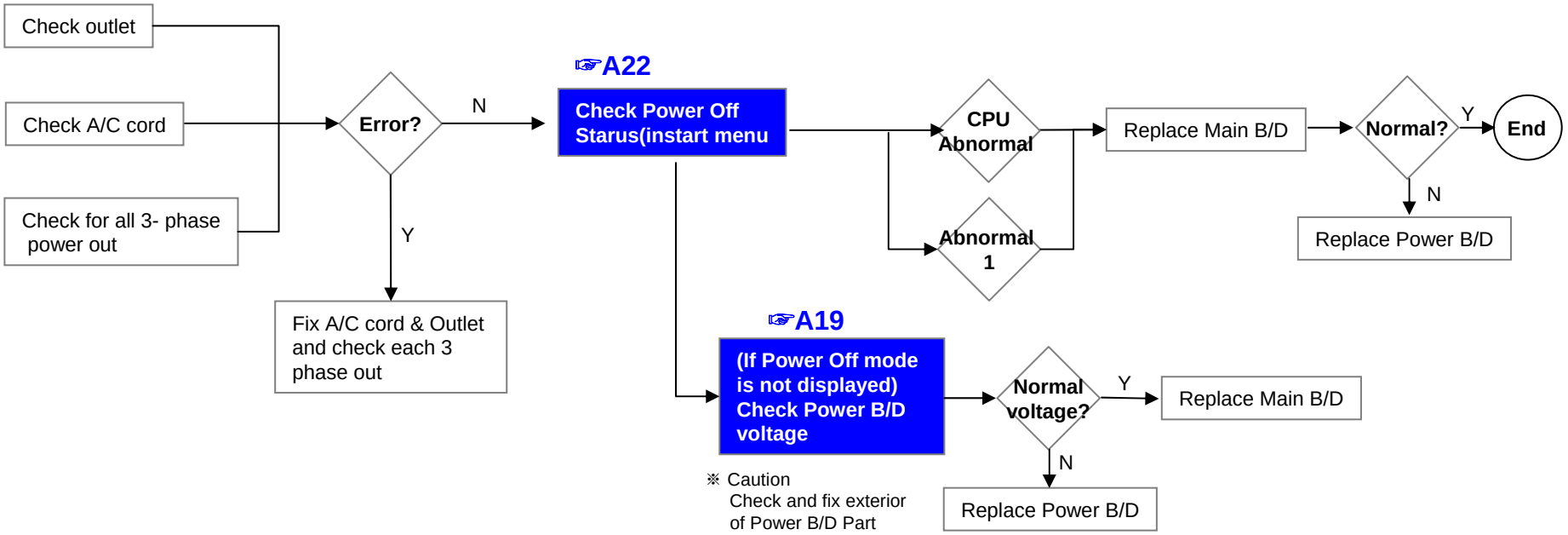


LCD TV	Error symptom	B. Power error	Established date		
		No power	Revised date		6/13



Standard Repair Process

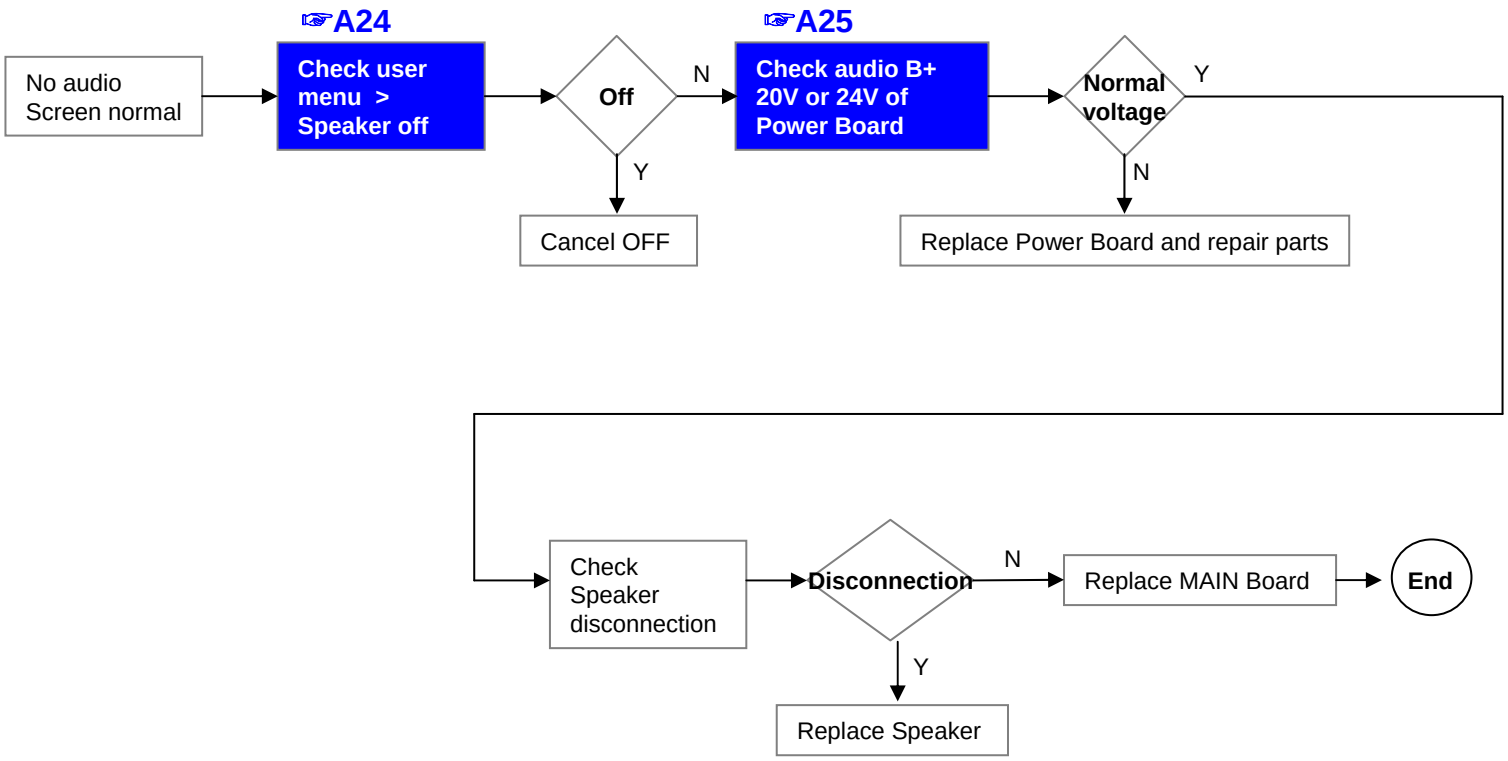
LCD TV	Error symptom	B. Power error	Established date		
		Off when on, off while viewing, power auto on/off	Revised date		7/13



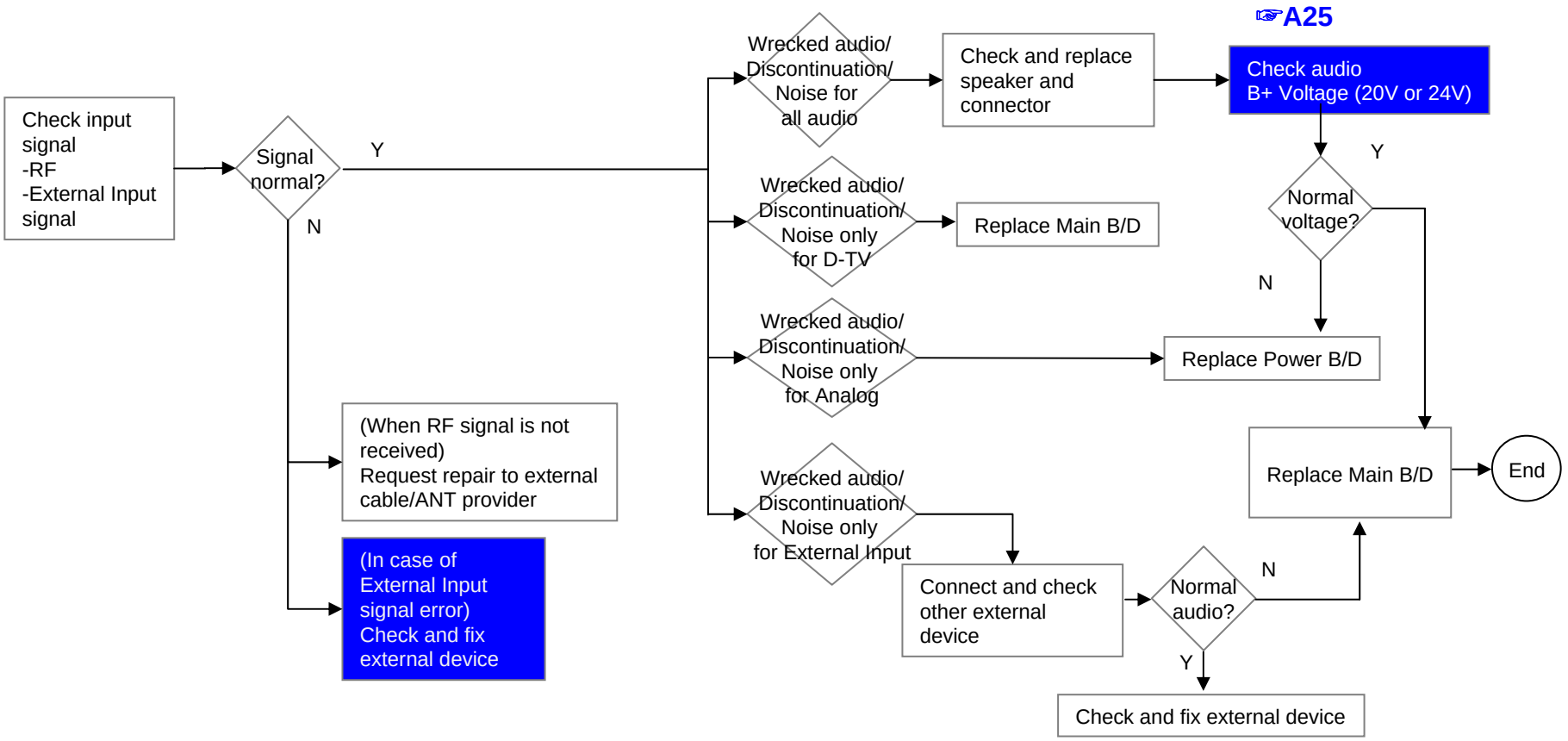
*** Please refer to the all cases which can be displayed on power off mode.**

Status	Power off List	Explanation
Normal	"POWEROFF_REMOTEKEY"	Power off by REMOTE CONTROL
	"POWEROFF_OFFTIMER"	Power off by OFF TIMER
	"POWEROFF_SLEEPTIMER"	Power off by SLEEP TIMER
	"POWEROFF_INSTOP"	Power off by INSTOP KEY
	"POWEROFF_AUTOOFF"	Power off by AUTO OFF
	"POWEROFF_ONTIMER"	Power off by ON TIMER
	"POWEROFF_RS232C"	Power off by RS232C
	"POWEROFF_RESREC"	Power off by Reservated Record
	"POWEROFF_RECEND"	Power off by End of Recording
	"POWEROFF_SWDOWN"	Power off by S/W Download
	"POWEROFF_UNKNOWN"	Power off by unknown status except listed case
Abnormal	"POWEROFF_ABNORMAL1"	Power off by abnormal status except CPU trouble
	"POWEROFF_CPUABNORMAL"	Power off by CPU Abnormal

LCD TV	Error symptom	C. Audio error	Established date		
		No audio/ Normal video	Revised date		8/13

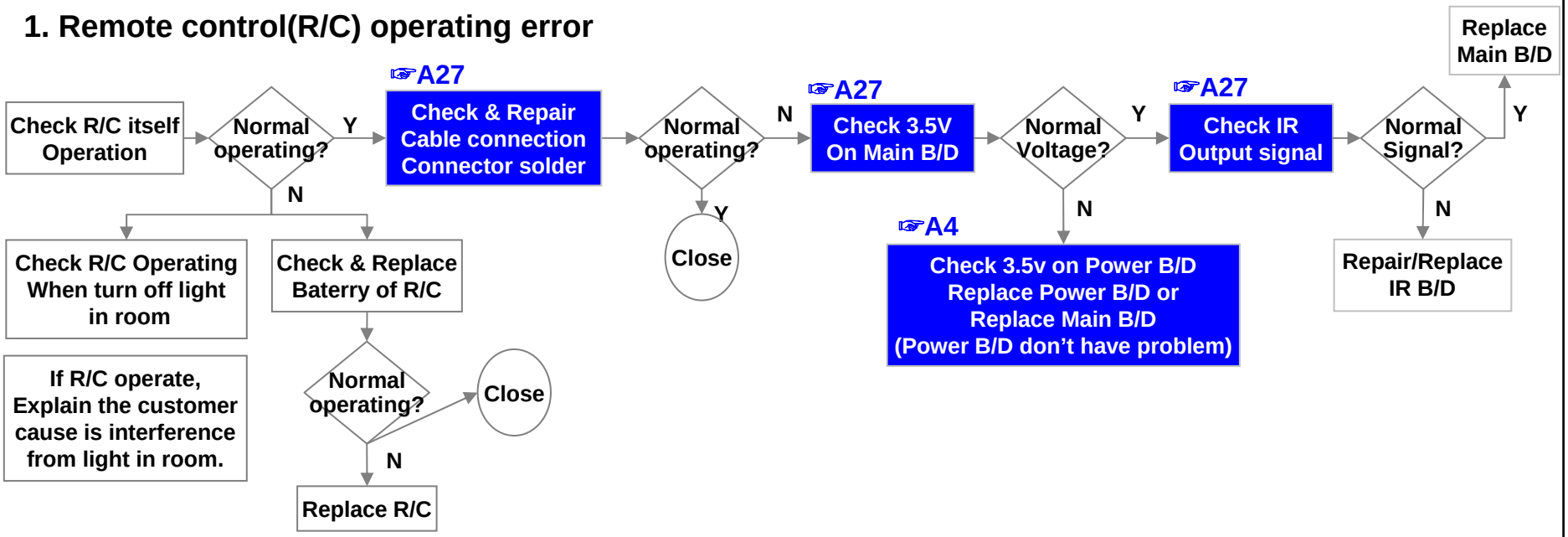


→ abnormal audio/discontinuation/noise is same after “Check input signal” compared to No audio

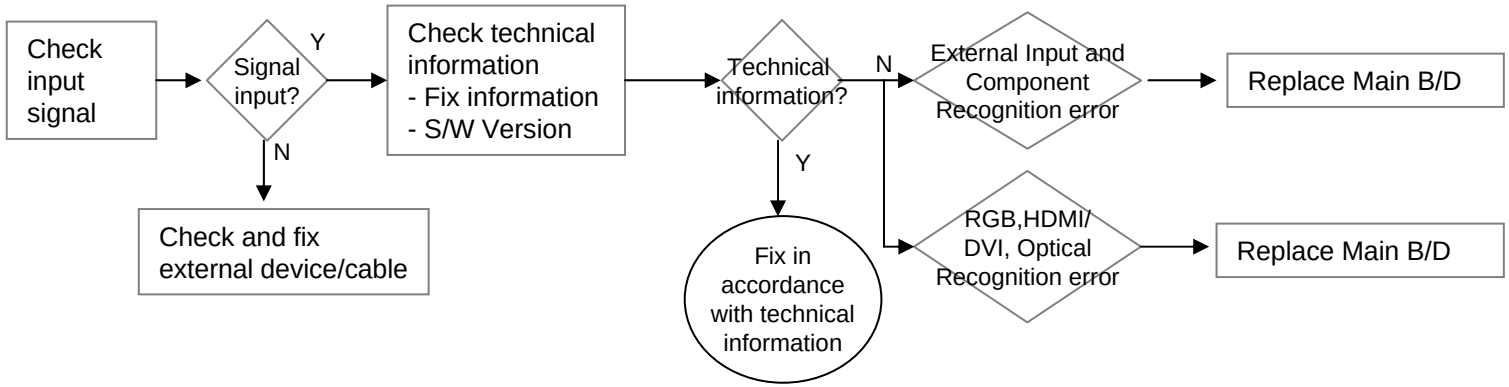


LCD TV	Error symptom	D. General Function Problem	Established date		
		Remote control & Local switch checking	Revised date		10/13

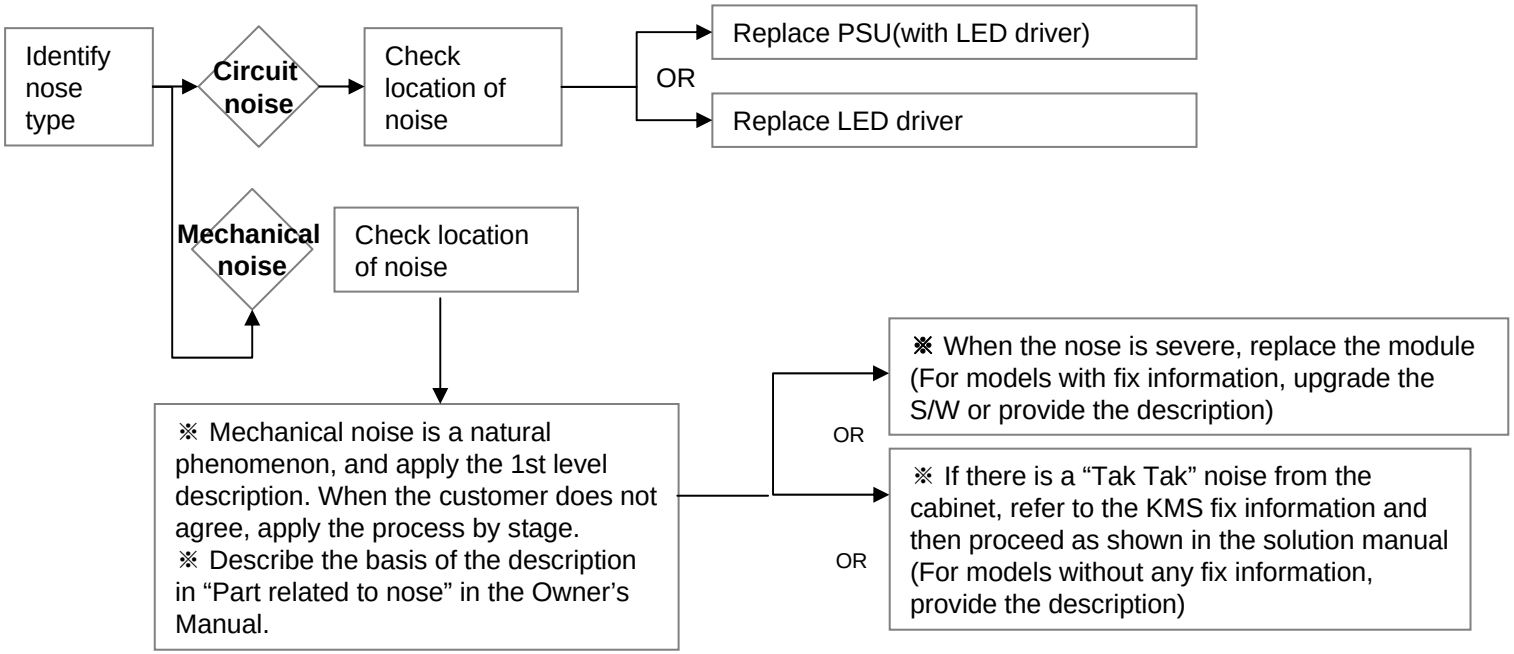
1. Remote control(R/C) operating error



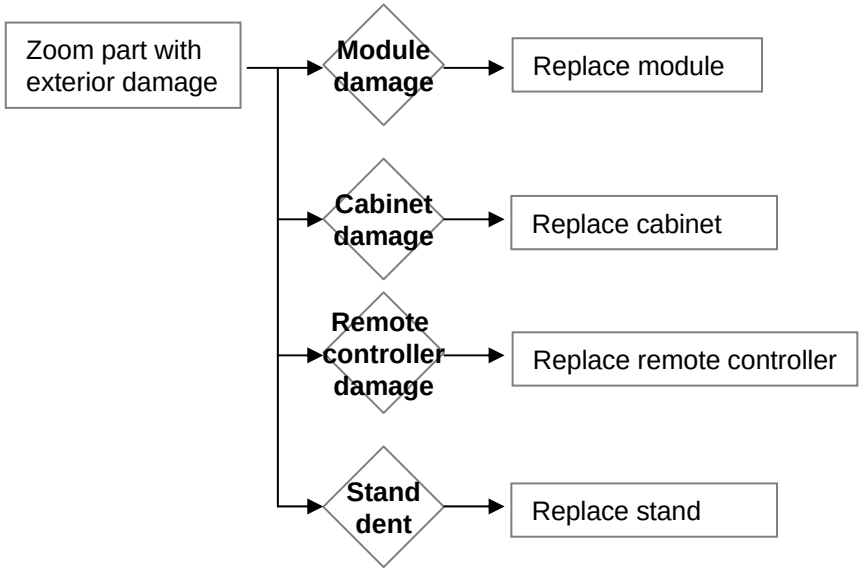
LCD TV	Error symptom	D. Function error	Established date		
		External device recognition error	Revised date		11/13



LCD TV	Error symptom	E. Noise	Established date		
		Circuit noise, mechanical noise	Revised date		12/13



LCD TV	Error symptom	F. Exterior defect	Established date		
		Exterior defect	Revised date		13/13



Contents of LCD TV Standard Repair Process Detail Technical Manual

No.	Error symptom	Content	Page	Remarks
1	A. Video error_ No video/Normal audio	Check LCD back light with naked eye	A1	
2		LED driver B+ 24V measuring method	A2	
3		Check White Balance value	A3	
4		Power Board voltage measuring method	A4	
5	A. Video error_ No video/Video lag/stop	TUNER input signal strength checking method	A6	
6		LCD-TV Version checking method	A7	
7	A. Video error_Color error	LCD TV connection diagram	A8	
8		Tuner Checking Part	A9	
9		Check Link Cable (LVDS) reconnection condition	A10	
10		Adjustment Test pattern - ADJ Key	A12	
11	A. Video error_Vertical/Horizontal bar, residual image, light spot	LCD TV connection diagram	A8	
12		Check Link Cable (LVDS) reconnection condition	A10	
13		Adjustment Test pattern - ADJ Key	A12	
14	<Appendix> Defected Type caused by T-Con/ Inverter/ Module	Exchange LED driver Board (PSU)	A-1/3	
15		Exchange Module itself (1)	A-2/3	
16		Exchange Module itself (2)	A-3/3	

Continue to the next page

Contents of LCD TV Standard Repair Process Detail Technical Manual

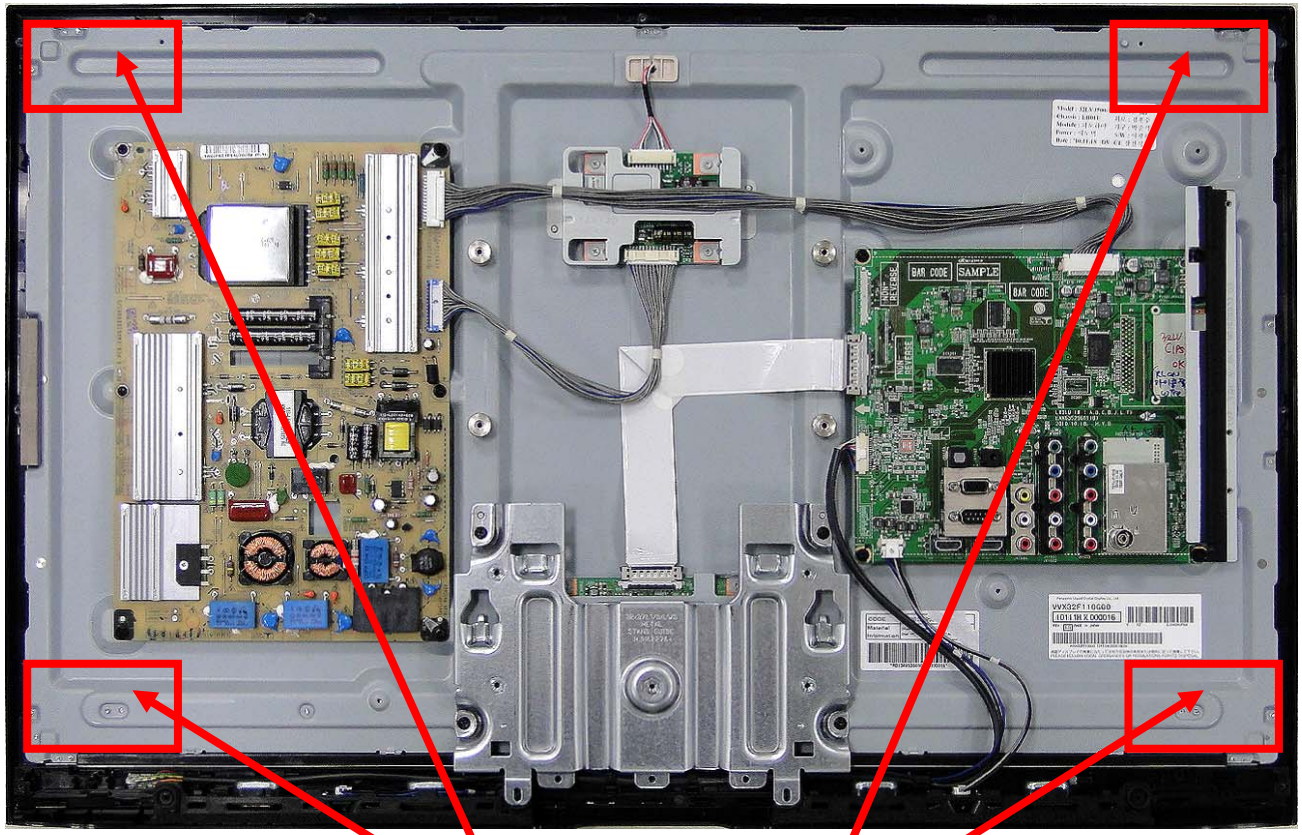
Continued from previous page

No.	Error symptom	Content	Page	Remarks
17	B. Power error_No power	Check front display LED	A17	
18		Check power input Voltage & ST-BY 5V	A18	
19		Checking method when power is ON	A19	
20		POWER BOARD voltage measuring method	A4	
21	B. Power error_Off when on, off while viewing	POWER OFF MODE checking method	A22	
22	B. Power error_Off when on, off while viewing	POWER BOARD PIN voltage checking method	A19	
23	C. Audio error_No audio/Normal video	Checking method in menu when there is no audio	A24	
24		Voltage and speaker checking method when there is no audio	A25	
25	C. Audio error_Wrecked audio/discontinuation	Voltage and speaker checking method in case of audio error	A25	
26	D. Function error_ No response in remote controller, key error	Remote controller operation checking method	A27	

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2011.01.20	
	Content	Check LCD back light with naked eye	Revised date		A1

<ALL MODELS>



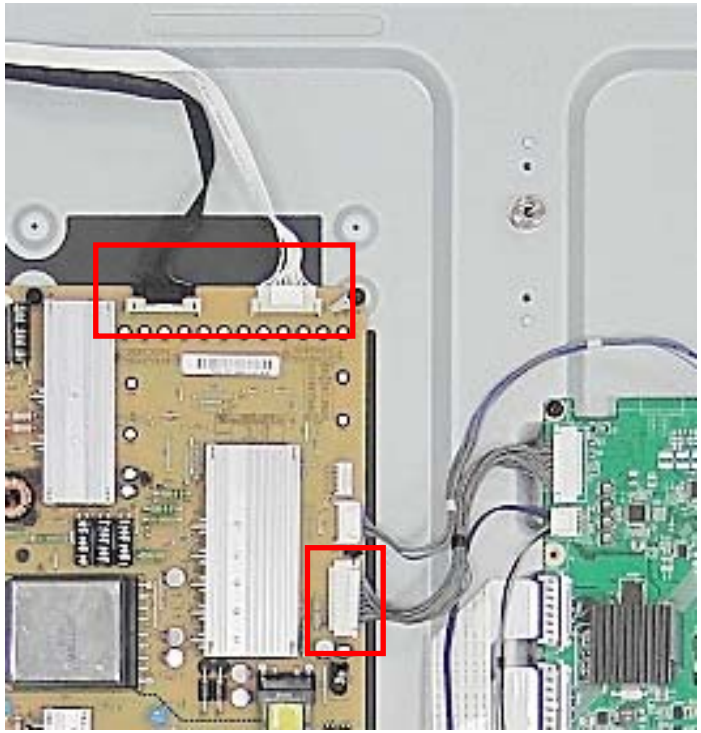
After turning on the power and disassembling the case, check with the naked eye, whether you can see light from 4 locations.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2011.01.20	
	Content	LED driver B+ 24V measuring method	Revised date		A2

Edge LED : PSU + LED Driver Type

Check the DC 24V and Inverter on



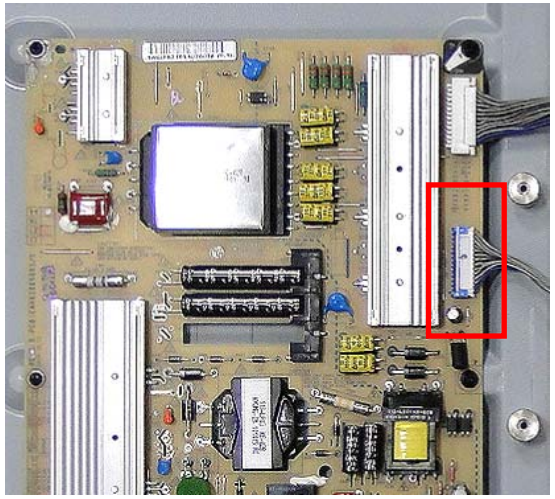
P202	
1~5	24V
6~10	GND
11	NC
12	NC

P203	
1~5	24V
6~10	GND
11	NC
12	Inverter ON
13	PWM Dim#1
14	NC

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2011.01.20	
	Content	LED driver B+ 24V measuring method	Revised date		A2

Edge LED / LAMP : PSU Type



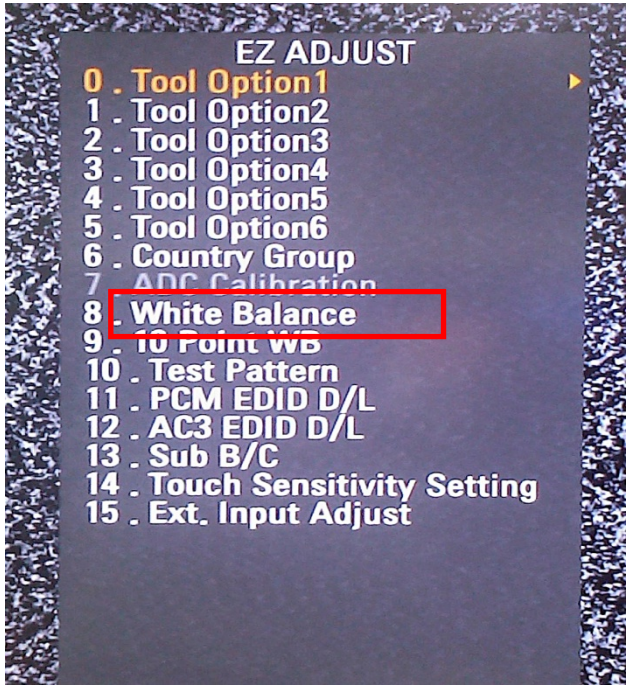
Check the DC 24V and Inverter on

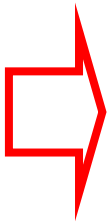
P202	
Type : 20010WR-H14B / C Maker : YEON-HO	
Pin No.	Signal
1	24V
2	24V
3	24V
4	24V
5	24V
6	GND
7	GND
8	GND
9	GND
10	GND
11	ERROR
12	INV ON/OFF
13	A-DIM
14	P-DIM

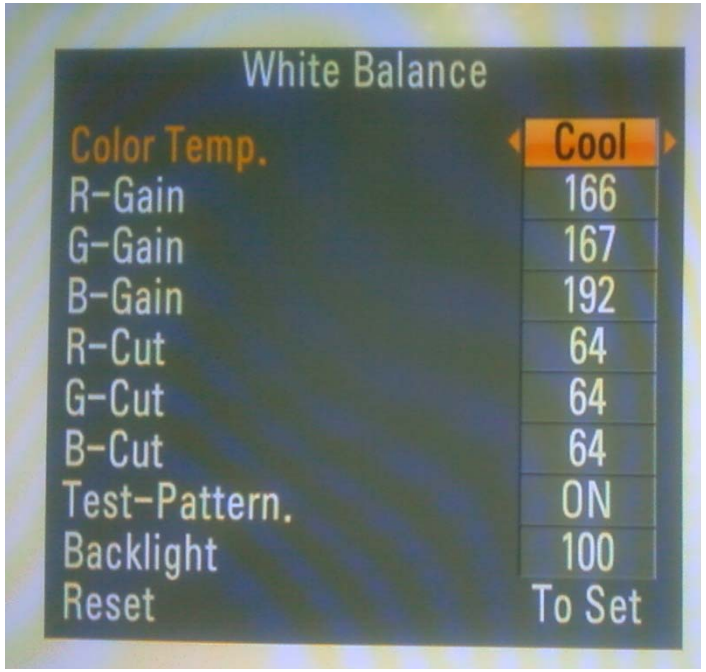
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/Normal audio	Established date	2011. 1 .19	
	Content	Check White Balance value	Revised date		A3

<ALL MODELS>





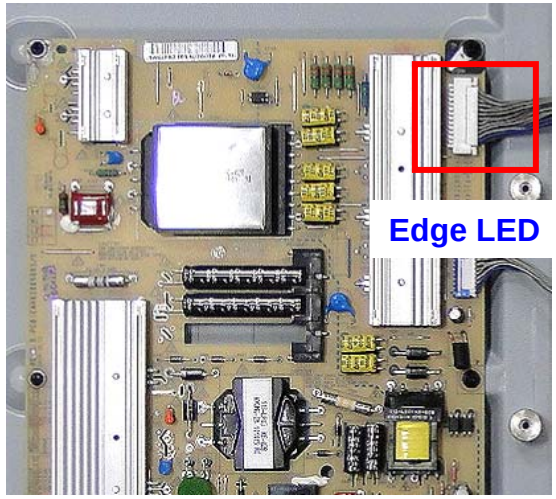


Entry method

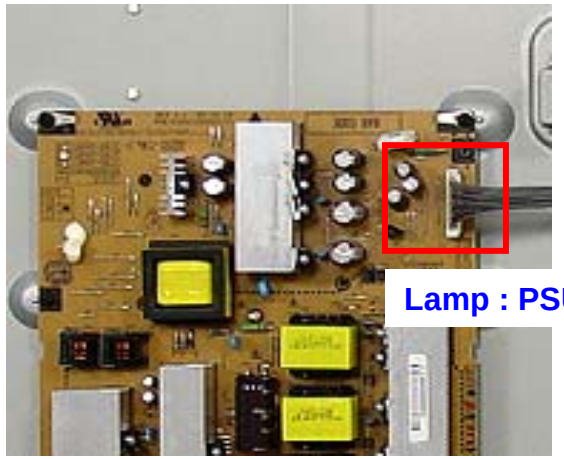
1. Press the ADJ button on the remote controller for adjustment.
2. Enter into White Balance of item 6.
3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/ Audio	Established date	2011. 1 .19	
	Content	Power Board voltage measuring method	Revised date		A4



Edge LED



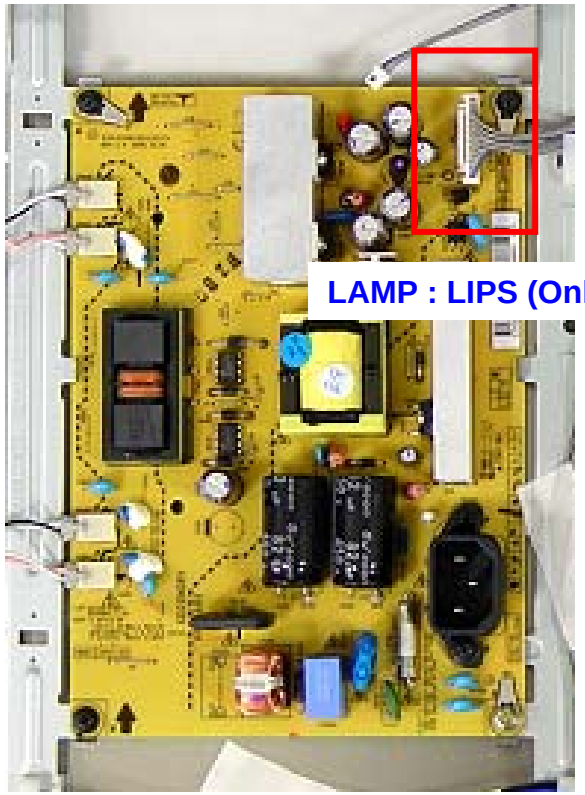
Lamp : PSU, LIPS

Check the DC 20V/24V, 12V, 3.5V.

24pin Pin layout			
1	Power on	2	20V (24V)
3	20V (24V)	4	20V (24V)
5	GND	6	GND
7	GND	8	GND
9	3.5V	10	3.5V
11	3.5V	12	3.5V
13	GND	14	GND
15	GND	16	NC
17	12V	18	Inverter ON
19	12V	20	NC
21	12V	22	PWM Dim #1
23	NC (Lamp SCANNING 모델: PWM Dim #2)	24	Error-out

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/ Audio	Established date	2011. 1 .19	
	Content	Power Board voltage measuring method	Revised date		A4



LAMP : LIPS (Only 22LK33)

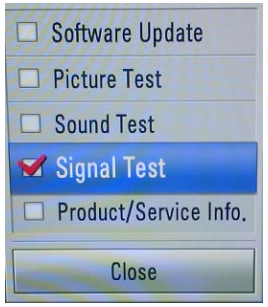
Check the DC 15V, 3.3V, 3.5V.

Pin No.	Symbol	Description
1, 2	Vout	15 Vdc Output
3, 4, 7	GND	GND
5, 6	Vout	3.5 Vdc Output
8	OLP	OLP Control
9	On/Off	TTL Hi=On, TTL Low=Off
10	BDim	3.3Vdc
11	ADim	0 ~ 5Vdc
12	N.C	N.C

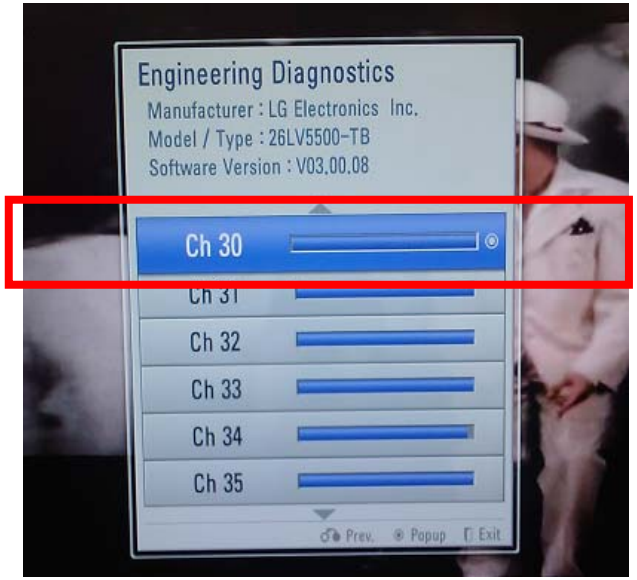
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date		
	Content	TUNER input signal strength checking method	Revised date		A6

<ALL MODELS>



MENU → red key (customer support → signal test → select channel



When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date		
	Content	LCD-TV Version checking method	Revised date		A7

<ALL MODELS>

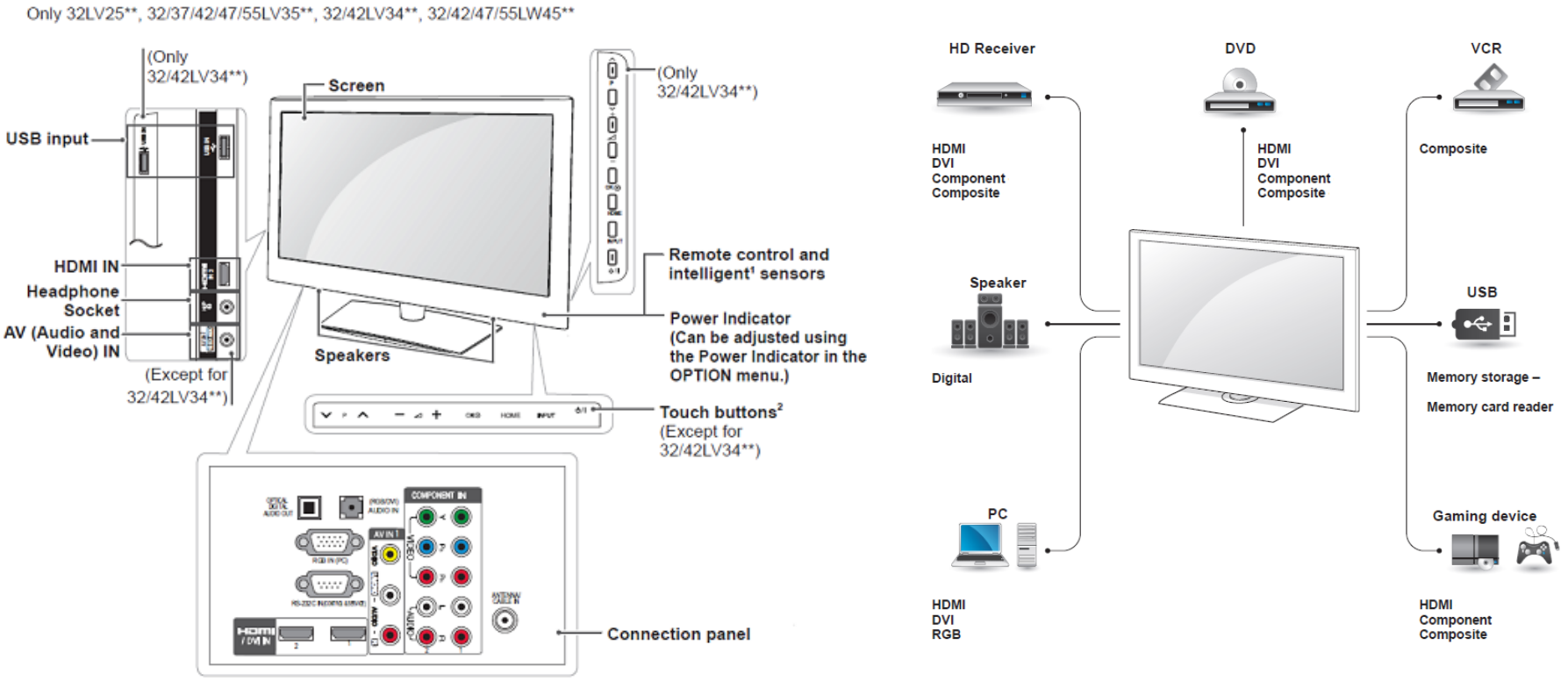
1. Checking method for remote controller for adjustment

Version

Press the IN-START with the remote controller for adjustment

Standard Repair Process Detail Technical Manual

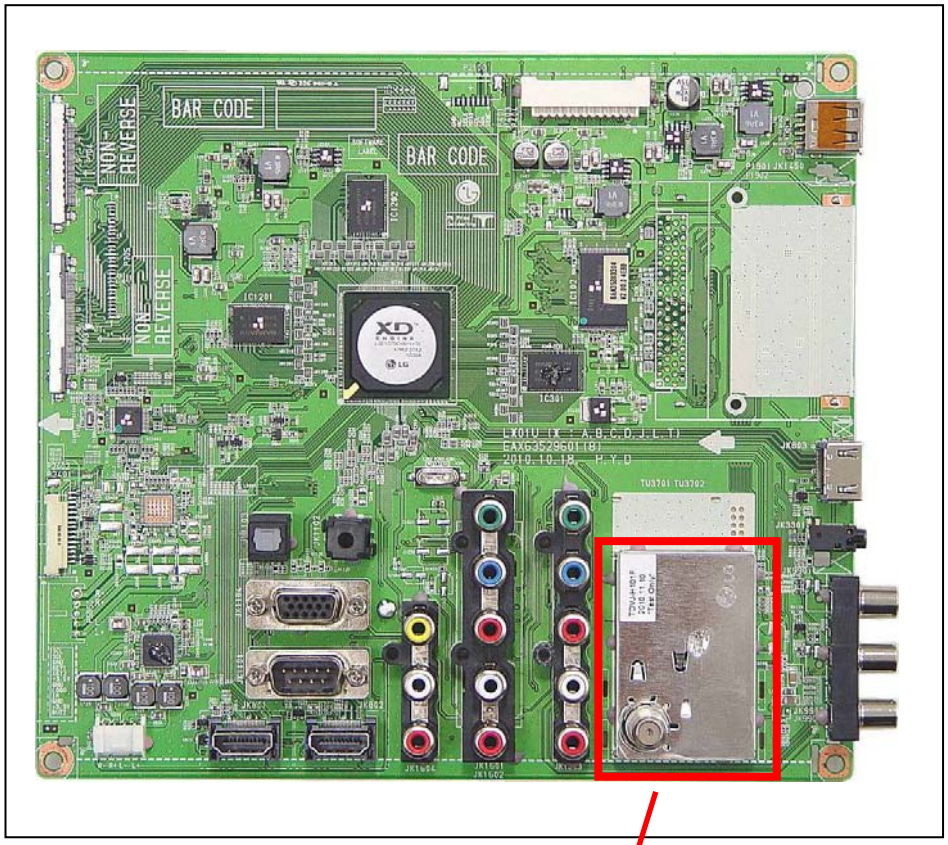
LCD TV	Error symptom	A. Video error _Vertical/Horizontal bar, residual image, light spot	Established date		
	Content	LCD TV connection diagram (1)	Revised date		A8



Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2010. 2 .19	
	Content	TUNER checking part	Revised date		A9

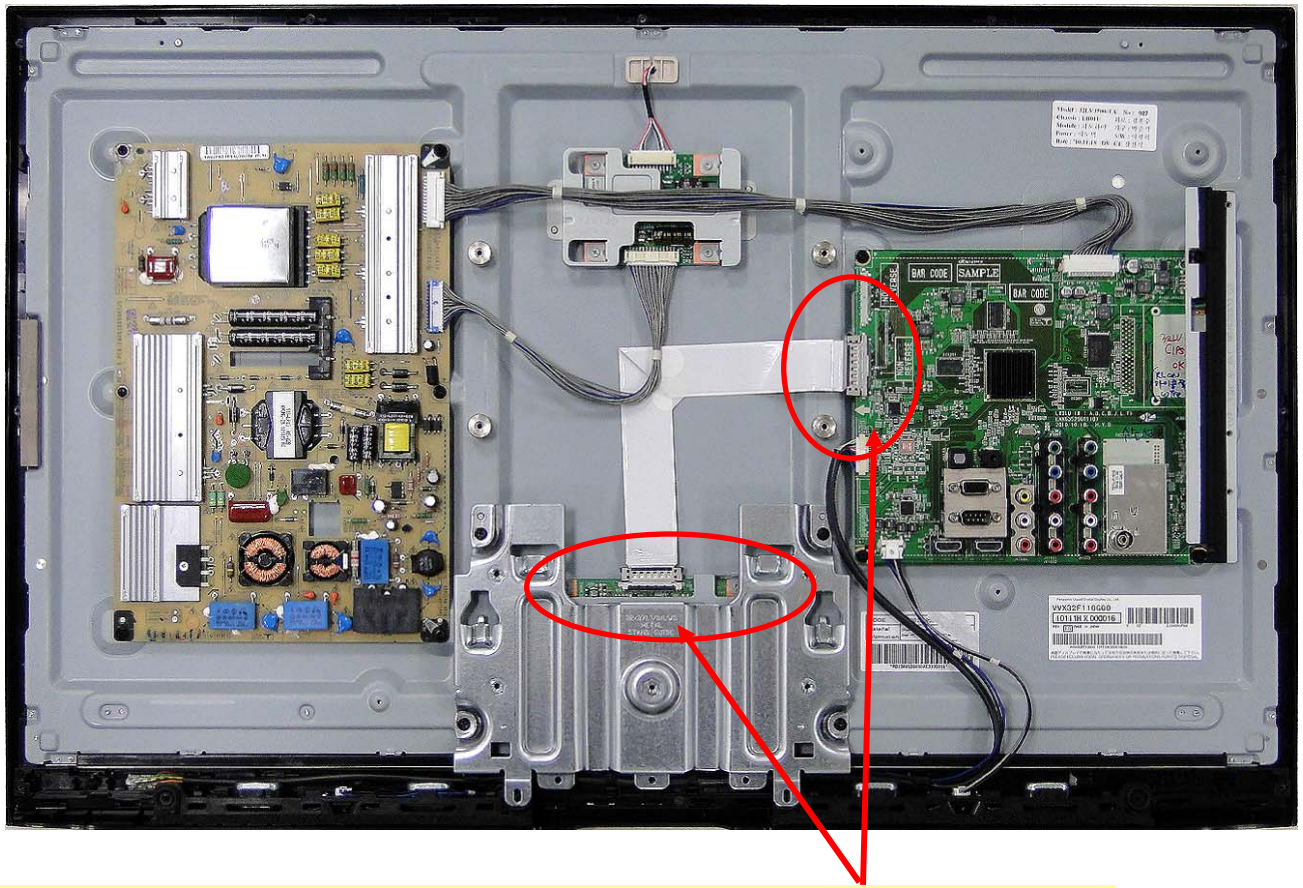
<ALL MODELS>



Checking method:
1. Check the signal strength or check whether the screen is normal when the external device is connected.
2. After measuring each voltage from power supply, finally replace the MAIN BOARD.

Standard Repair Process Detail Technical Manual

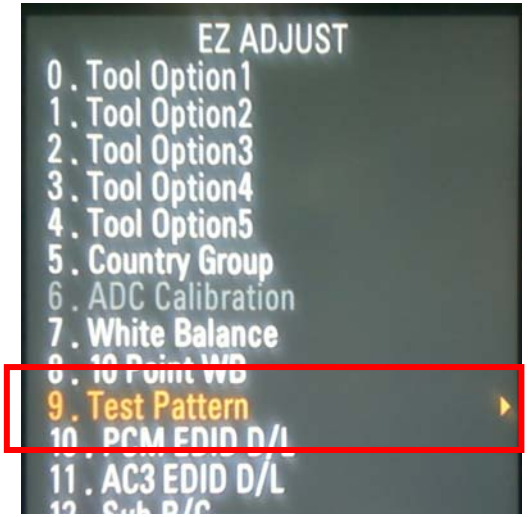
LCD TV	Error symptom	A. Video error_Color error	Established date	2011.01.20	
	Content	Check Link Cable (LVDS) reconnection condition	Revised date		A10



Check the contact condition of the Link Cable, especially dust or mis insertion.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Color error	Established date		
	Content	Adjustment Test pattern - ADJ Key	Revised date		A12

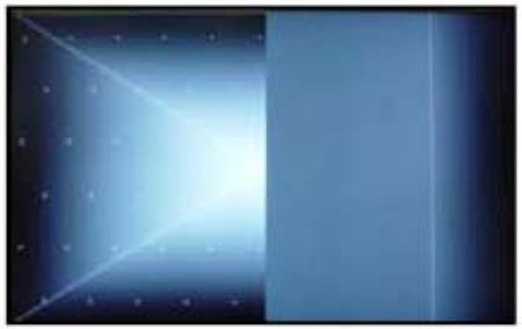


You can view 6 types of patterns using the ADJ Key

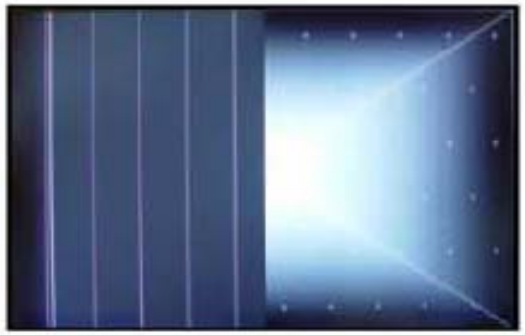
Checking item : 1. Defective pixel 2. Residual image 3. MODULE error (ADD-BAR,SCAN BAR..)
4.Video error (Classification of MODULE or Main-B/D!)

Appendix : Exchange T-Con Board (1)

Solder defect, CNT Broken

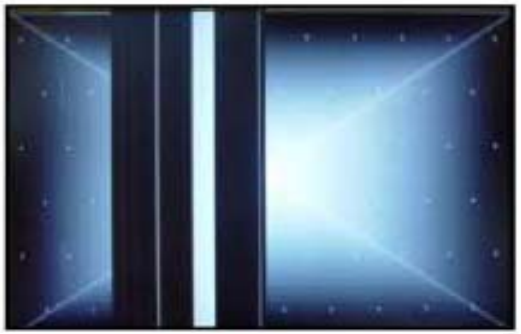


Solder defect, CNT Broken

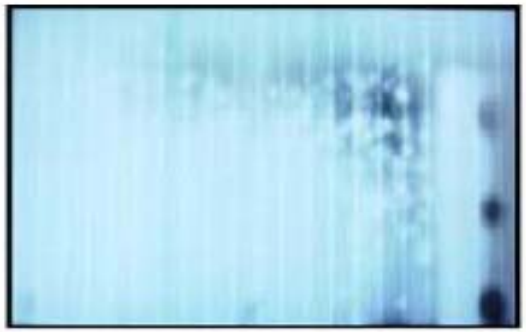


Solder defect, CNT Broken

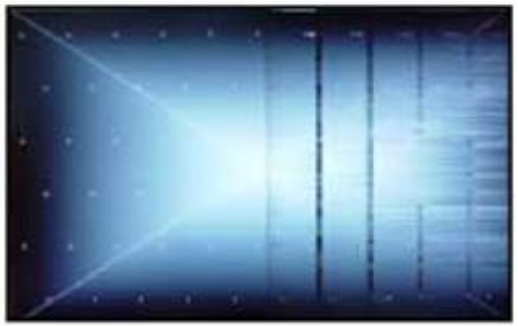
Solder defect, CNT Broken



Solder defect, CNT Broken



Abnormal Power Section

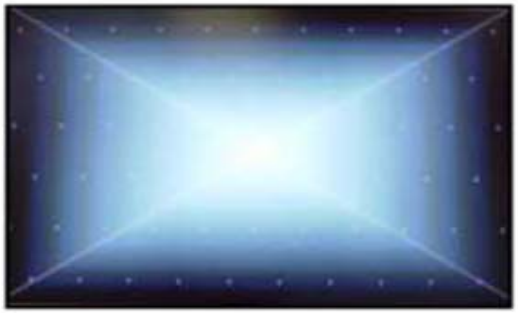


Solder defect, Short/Crack

Abnormal Power Section

Solder defect, Short/Crack

Appendix : Exchange T-Con Board (2)



Abnormal Power Section

Abnormal Power Section

Solder defect, Short/Crack

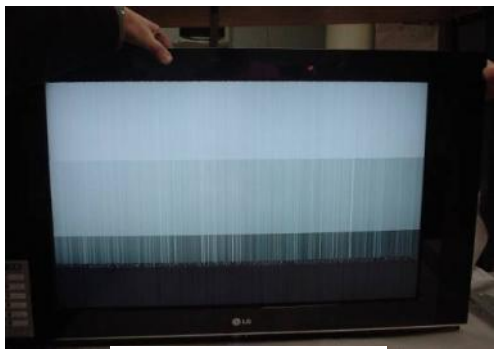
Solder defect, Short/Crack

Fuse Open, Abnormal power section

Abnormal Display

GRADATION

Noise

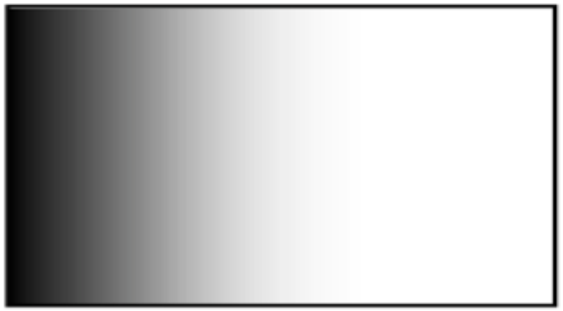


GRADATION

Appendix : Exchange PSU(LED driver)

No Light

Dim Light



Dim Light

Dim Light

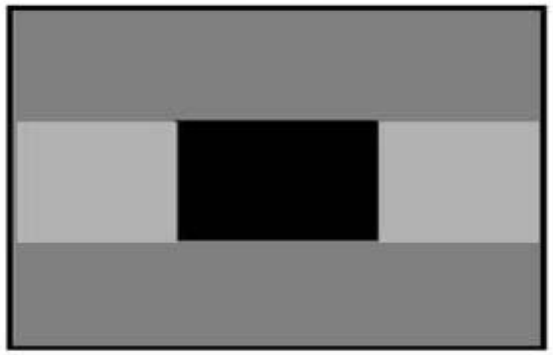
No picture/Sound Ok

Appendix : Exchange the Module (1)

Panel Mura, Light leakage

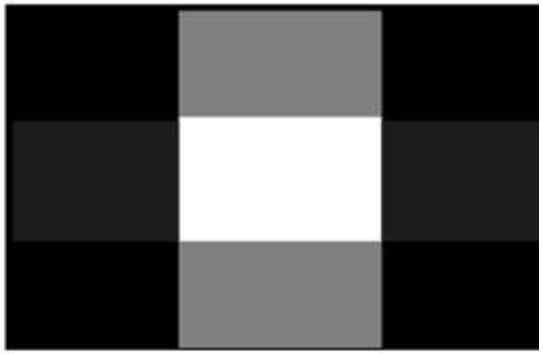
Panel Mura, Light leakage

Press damage



Crosstalk

Press damage



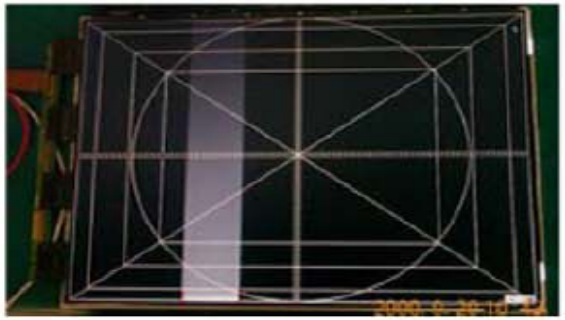
Crosstalk

Press damage

Un-repairable Cases

In this case please exchange the module.

Appendix : Exchange the Module (2)



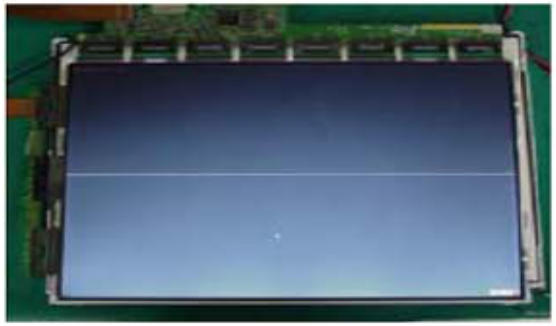
Vertical Block
Source TAB IC Defect

Vertical Line
Source TAB IC Defect

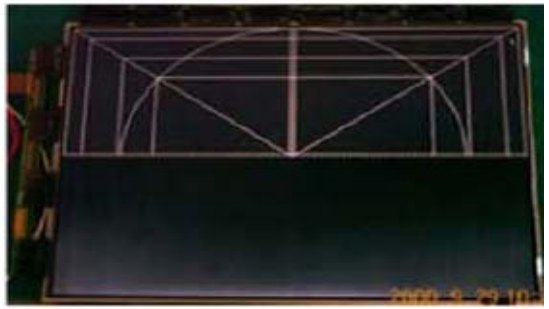
Vertical Block
Source TAB IC Defect

Horizontal Block
Gate TAB IC Defect

Horizontal Block
Gate TAB IC Defect



Horizontal line
Gate TAB IC Defect



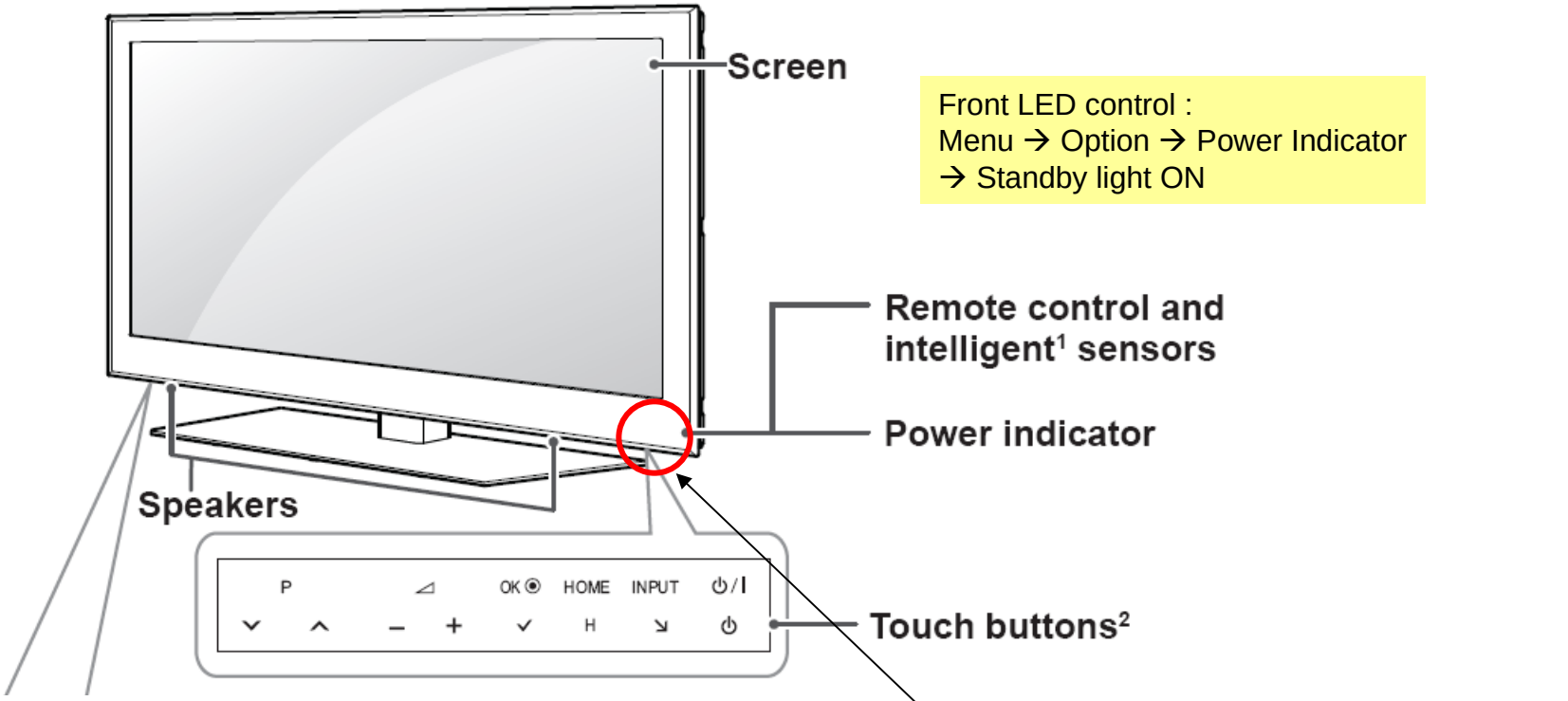
Horizontal Block
Gate TAB IC Defect

Un-repairable Cases

In this case please exchange the module.

Standard Repair Process Detail Technical Manual

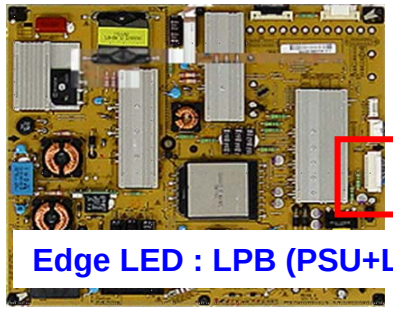
LCD TV	Error symptom	B. Power error _No power	Established date	2011.01.20	
	Content	Check front display LED	Revised date		A17



Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2011. 1. 20	
	Content	Check power input voltage and ST-BY 3.5V	Revised date		A18

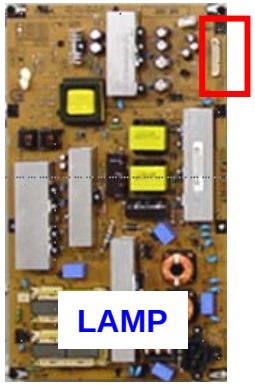
For ’11 models, there is no voltage out for st-by purpose.
When TV is st-by status(DC OFF), only 3.5V output is normally on.



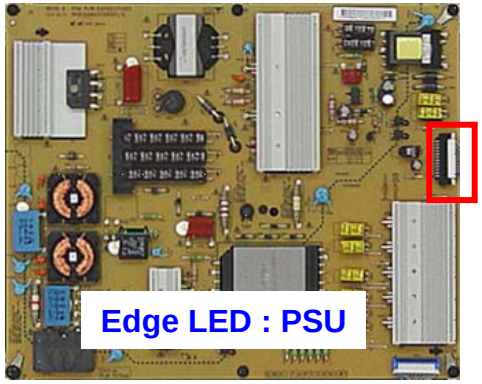
Edge LED : LPB (PSU+LED Driver)

Check the 3.5V signal of 24pin power out when TV is st-by status

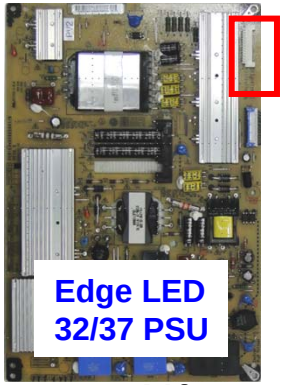
Pin layout (24P)			
1	Power on	2	24V 20V (Edge 32/37 Only)
3	20/24V	4	20/24V
5	GND	6	GND
7	GND	8	GND
9	3.5V	10	3.5V
11	3.5V	12	3.5V
13	GND	14	GND
15	GND	16	PSU : GND, LPB : NC
17	12V	18	Inverter ON
19	12V	20	LED : NC
21	12V	22	PWM Dim #1
23	NC (Lamp Scanning Model : PWM Dim #2)	24	Error-out



LAMP



Edge LED : PSU

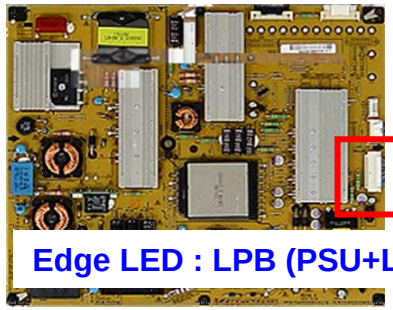


Edge LED 32/37 PSU

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2011. 1. 20	
	Content	Checking method when power is ON	Revised date		A19

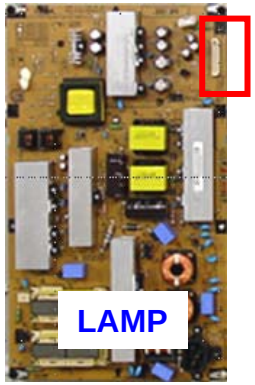
There are several wafers on power board.
Don't get confused about 24P power out wafer.
You can refer to not only left pictures and 'P201' silk print near by wafer.



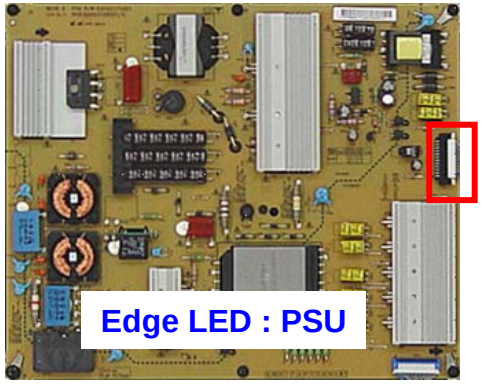
Edge LED : LPB (PSU+LED Driver)

Check "power on" pin is high

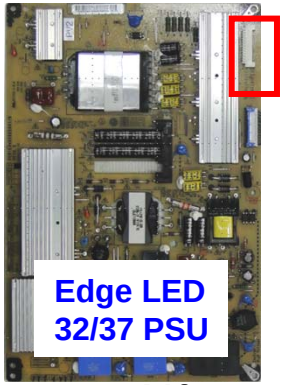
Pin layout (24P)			
1	Power on	2	24V 20V (Edge 32/37 Only)
3	20/24V	4	20/24V
5	GND	6	GND
7	GND	8	GND
9	3.5V	10	3.5V
11	3.5V	12	3.5V
13	GND	14	GND
15	GND	16	PSU : GND, LPB : NC
17	12V	18	Inverter ON
19	12V	20	LED : NC
21	12V	22	PWM Dim #1
23	NC (Lamp Scanning Model : PWM Dim #2)	24	Error-out



LAMP



Edge LED : PSU

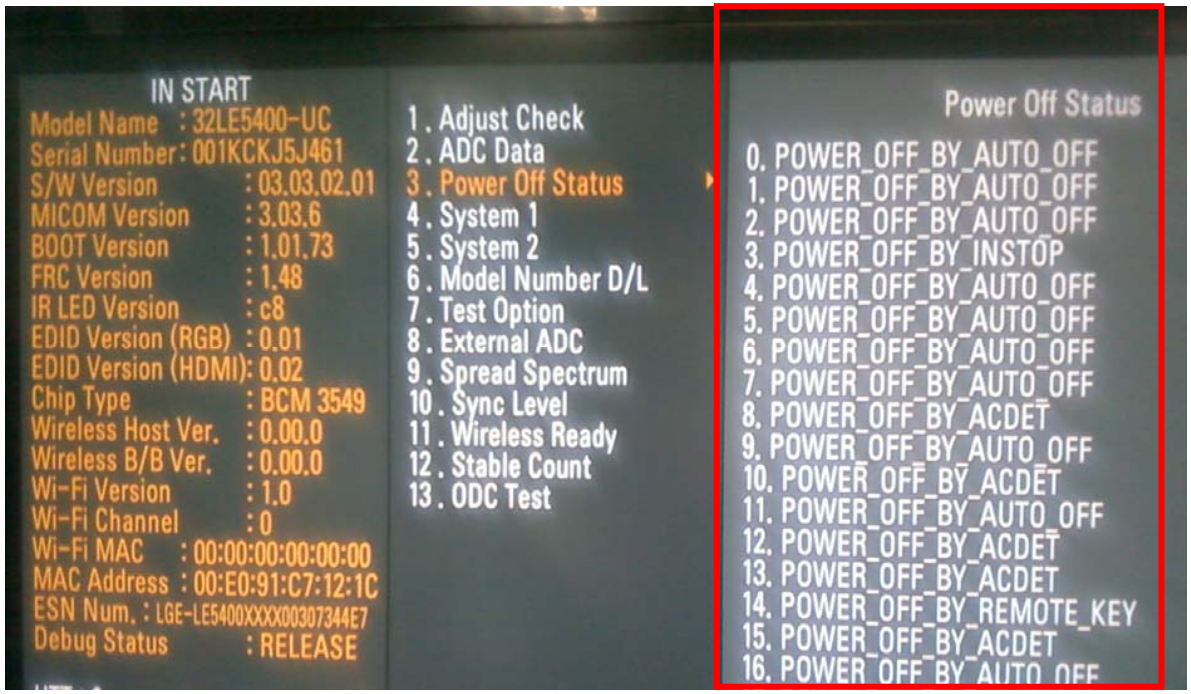


Edge LED 32/37 PSU

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _Off when on, off whiling viewing	Established date		
	Content	POWER OFF MODE checking method	Revised date		A22

<ALL MODELS>



Entry method

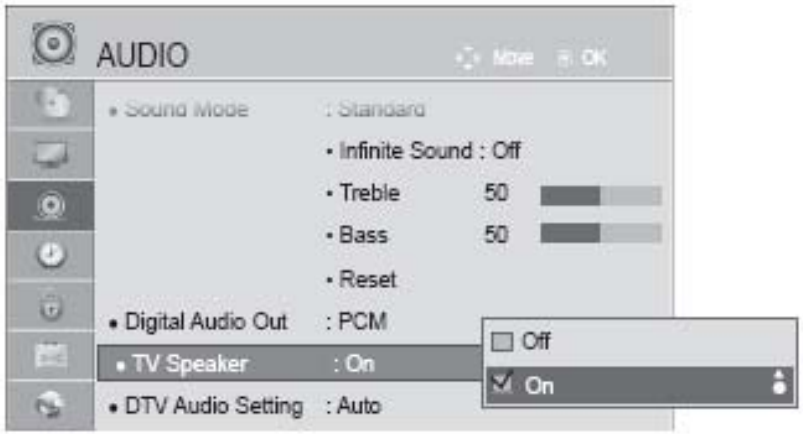
1. Press the IN-START button of the remote controller for adjustment

2. Check the entry into adjustment item 3

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date		
	Content	Checking method in menu when there is no audio	Revised date		A24

<ALL MODELS>



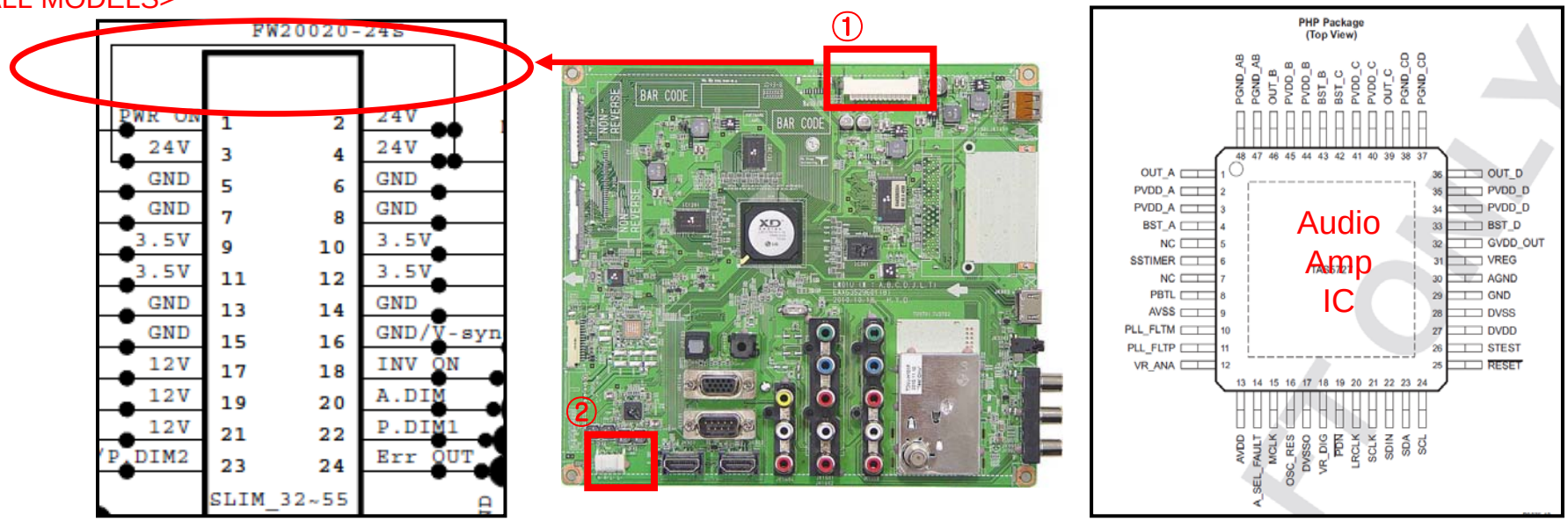
Checking method

1. Press the MENU button on the remote controller
2. Select the AUDIO function of the Menu
3. Select TV Speaker from Off to On

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2011. 01 .18	
	Content	Voltage and speaker checking method when there is no audio	Revised date		A25

<ALL MODELS>



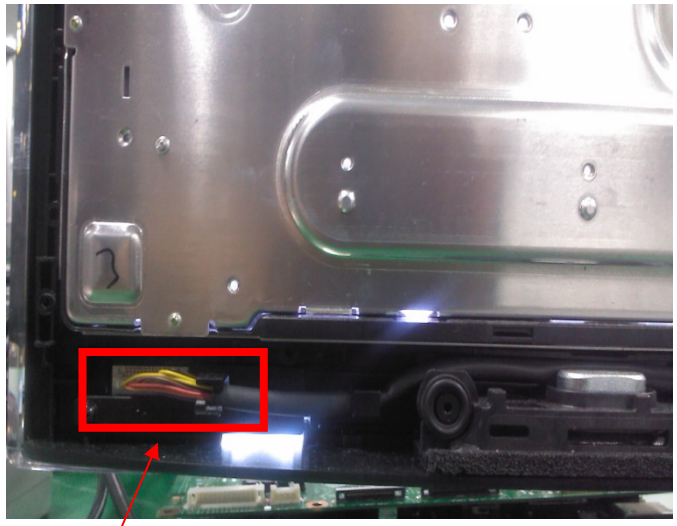
Checking order when there is no audio

1. Measure the 24V input voltage supplied from Power Board
   (If there is no input voltage, replace power board or connector)
2. Connect the tester RX1 to the speaker terminal and if you hear the Buzzer sound when you touch the GND and output terminal, the speaker is normal.
3. Check signal input to the Audio amp IC. Such as below
   - MCLK (master clock) : 12.288 MHz
   - RESET : normal status is high
   - VDD (Power)
   - LRCLK : 48KHz
   - SCLK : 3.072MHz

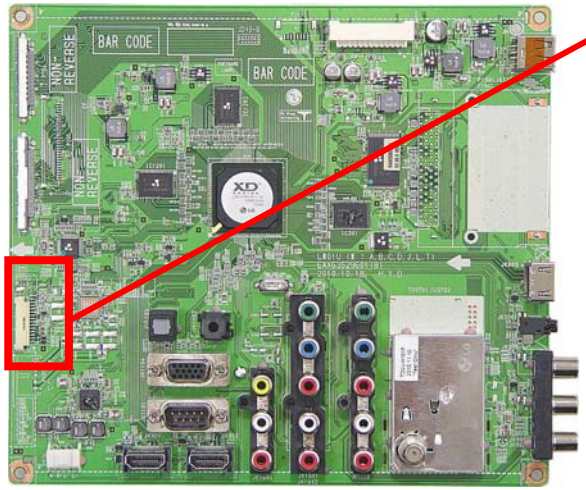
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. Function error_ No response in remote controller, key error	Established date	2010. 2 .19	
	Content	Remote controller operation checking method	Revised date		A27

<ALL MODELS>



1



2

3

4

	LW45,LV35 LV25 P2402		LV34,LK43 LK53,LK33 P2401	
1	SCL	1	SCL	
2	SDA	2	SDA	
3	GND	3	GND	
4	KEY1	4	KEY1	
5	KEY2	5	KEY2	
6	St 3.3V	6	St 3.3V	
7	GND	7	GND	
8	LED_B	8	LED_B	
9	IR	9	IR	
10	GND	10	GND	
11	Normal 3.3V	11	Normal 3.3V	
12	LED_R	12	LED_R	
13	GND			
14	S/T_SCL			
15	S/T_SDA			

Checking order

1, 2. Check IR cable condition between IR & Main board.
3. Check the st-by 3.3V on the terminal 6.
4. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.